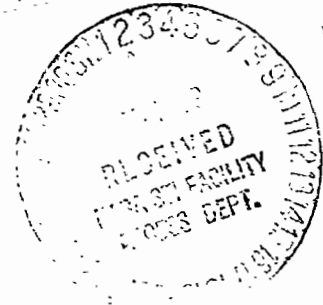


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**MCDONNELL DOUGLAS ASTRONAUTICS COMPANY**

**MCDONNELL DOUGLAS**  
CORPORATION



# **POWER EXTENSION PACKAGE (PEP)**

## **SYSTEM DEFINITION EXTENSION**

**Orbital Service Module Systems Analysis Study**

**VOLUME 12**  
**PEP Data Item Descriptions**

**AUGUST 1979**

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A handwritten signature in dark ink, appearing to read "D. C. Wensley", written over the printed name and title.

**PREPARED FOR: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**  
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## PREFACE

The extension phase of the Orbital Service Module (OSM) Systems Analysis Study was conducted to further identify Power Extension Package (PEP) system concepts which would increase the electrical power and mission duration capabilities of the Shuttle Orbiter. Use of solar array power to supplement the Orbiter's fuel cell/cryogenic system will double the power available to payloads and more than triple the allowable mission duration, thus greatly improving the Orbiter's capability to support the payload needs of sortie missions (those in which the payload remains in the Orbiter).

To establish the technical and programmatic basis for initiating hardware development, the PEP concept definition has been refined, and the performance capability and the mission utility of a reference design baseline have been examined in depth. Design requirements and support criteria specifications have been documented, and essential implementation plans have been prepared. Supporting trade studies and analyses have been completed.

The study report consists of 12 documents:

- Volume 1 Executive Summary
- Volume 2 PEP Preliminary Design Definition
- Volume 3 PEP Analysis and Tradeoffs
- Volume 4 PEP Functional Specification
- Volume 5 PEP Environmental Specification
- Volume 6 PEP Product Assurance
- Volume 7 PEP Logistics and Training Plan Requirements
- Volume 8 PEP Operations Support
- Volume 9 PEP Design, Development, and Test Plans
- Volume 10 PEP Project Plan
- Volume 11 PEP Cost, Schedules, and Work Breakdown Structure Dictionary
- Volume 12 PEP Data Item Descriptions

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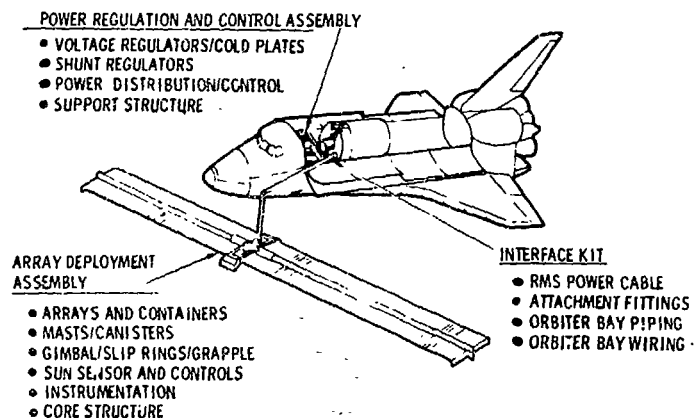
## FOREWORD

The Power Extension Package (PEP) is a solar electrical power generating system to be used on the Shuttle Orbiter to augment its power capability and to conserve fuel cell cryogenic supplies, thereby increasing power available for payloads and allowing increased mission duration. The Orbiter, supplemented by PEP, can provide up to 15 kW continuous power to the payloads for missions of up to 48 days duration.

When required for a sortie mission, PEP is easily installed within the Orbiter cargo bay as a mission-dependent kit. When the operating orbit is reached, the PEP solar array package is deployed from the Orbiter by the remote manipulator system (RMS). The solar array is then extended and oriented toward the sun, which it tracks using an integral sun sensor/gimbal system. The power generated by the array is carried by cables on the RMS back into the cargo bay, where it is processed and distributed by PEP to the Orbiter load buses. After the mission is completed, the array is retracted and restowed within the Orbiter for earth return.

The figure below shows the PEP system, which consists of two major assemblies -- the Array Deployment Assembly (ADA) and the Power Regulation and Control Assembly (PRCA) -- plus the necessary interface kit. It is nominally installed at the forward end of the Orbiter bay above the Spacelab tunnel, but can be located anywhere within the cargo bay if necessary. The ADA, which is deployed, consists of two lightweight, foldable solar array wings with their containment boxes and deployment masts, two diode assembly interconnect boxes, a sun tracker/control/instrumentation assembly, a two-axis gimbal/slip ring assembly, and the RMS grapple fixture. All these items are mounted to a support structure that interfaces with the Orbiter. The PRCA, which remains in the Orbiter cargo bay, consists of six pulse width modulated voltage regulators mounted to three cold plates, three shunt regulators to protect the Orbiter buses from overvoltage, and a power distribution and control box, all mounted to a support beam that interfaces with the Orbiter.

PEP is compatible with all currently defined missions and payloads and imposes minimal weight and volume penalties on these missions. It can be installed and removed as needed at the launch site within the normal Orbiter turnaround cycle.



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TRAINING (TG)

DATA REQUIREMENTS LIST (DRL) 109

DATA REQUIREMENT DESCRIPTION (DRD) 110

## 1.0 INTRODUCTION

1.1 This specification defines the Contractor information requirements necessary to support the Power Extension Package (PEP) Project of the Space Shuttle Program.

1.2 Data shall be prepared, maintained and delivered to NASA/JSC in accordance with the requirements specified herein.

## 2.0 GENERAL REQUIREMENTS

### 2.1 Data Requirements List (DRL)

Throughout the performance of the contract, the DRL at all times provides a complete listing of the data requirements of the contract. However, all data requirements of the general provisions of this contract must be complied with whether or not listed in the DRL. The DRL is not presented as an entity, but rather, is segmented into separate categorized listings that precede each section of DR's (see paragraph 6.0).

### 2.2 Data Requirement (DR)

Each data requirement listed on the DRL is given complete definition by a DR. The DR prescribes content, format, maintenance instructions, and submittal requirements.

### 2.3 Classification and Categories of Data

#### 2.3.1 Classification

Data required shall be categorized as follows:

- a. Type 1 - Type 1 data shall be submitted to NASA for approval. Implementation of Type 1 documentation shall not proceed until after approval by NASA or until 21 days after receipt at NASA,



provided notice of disapproval has not been received by the contractor.

- b. Type 2 - Type 2 data shall be submitted to NASA for coordination, surveillance, information, review, and/or management control.
- c. Type 3 - Type 3 data shall be retained by the contractor and delivered to NASA in accordance with the "Optional Data Requirements" clause.

#### 2.3.2 Categories of Data

Data prepared by the contractor shall be categorized as follows:

- a. MA - Project management
- b. CM - Configuration management
- c. SE - Systems Engineering and test
- d. MG - Manufacturing
- e. RA - Reliability, Quality Assurance and safety
- f. LS - Logistics
- g. TS - Training
- h. OP - Operations

2.3.2.1 Other categories of data may be suggested if they better suit the Contractor's internal system.

2.3.2.2 To facilitate the usage and maintenance of this specification, the DR's have been sectionalized in accordance with the above data categories.

2.3.2.3 Each section contains all DR's within a specific data category. The DR's are filed in numerical sequence and are listed on a DRL page (or pages) that precedes the DR's for the specific category.

### 2.3.3 Other Requirements

- 2.3.3.1 Except as otherwise provided in this contract, the cost of data to be furnished in response to this specification is included in the price of this contract if it is a fixed price contract; or, if this is a cost-reimbursement type contract, the cost is included in the total cost and shall be reimbursed in accordance with the Schedule of the Contract.
- 2.3.3.2 Documents referenced in this specification are the issue in effect at the time of request for quotation, unless otherwise specified, and form a part of the specification to the extent specified herein.
- 2.3.3.3 Delivery and distribution shall be accomplished in accordance with the DR and as directed by the COR or Contracting Officer.
- 2.3.3.4 References to other documents in data submitted in response to requirements of this specification are permissible. Referenced documents must be adequate and include such identification elements as title and number. When a document to be referenced would only be applicable to a minor or limited extent, every effort shall be made to include the applicable information in the response document rather than using the reference. All referenced documents shall be made readily available to the cognizant NASA organization upon request.
- 2.3.3.5 Where practicable, the contractor's own internal documents or those of a subcontractor shall be utilized to meet and/or supplement the requirements specified herein, i.e., internal documents shall not be retyped and printed on more expensive paper prior to submittal.
- 2.3.3.6 In addition to the requirements contained herein, the Contractor may be required to furnish documentation in accordance with the Contract Schedule and/or general provisions.

### 3.0 DATA IDENTIFICATION

3.1 All data shall be organized into a series of numbered documents and shall contain the following minimum information on the cover sheet or title page, as appropriate:

- Company identification
- Document title and identification number
- Date of issuance
- Contract Number
- Work Breakdown Structure (WBS) number
- DRL number (except drawings and ECP's)

3.2 Documents that are subsequently published by NASA will be identified as prescribed by NASA.

3.3 All Type 1 data will be marked "PRELIMINARY PENDING NASA APPROVAL" and, once approved, shall be reissued having the "APPROVED BY NASA" and the date and approval authority annotated on the cover.

3.4 Printing of formal reports and data in book format shall be in accordance with the Government Printing and Binding Regulations (published by the Joint Committee on Printing (JCP)) as spelled out in the basic contract.

3.5 When microfilm of drawings, specifications and associated lists is required, it shall be 35mm silver halide negative, first generation (Type 1, Class 1) in accordance with NHB 1440.4A. Input form 1360 shall be used for logging purposes. The microfilm shall be submitted in the form of roll microfilm not in excess of 100 feet in length.

### 4.0 MAINTENANCE

#### 4.1 Revisions

Revisions to documentation may be accomplished either by individual page revision or a complete reissue of the document, except for drawings which shall be revised in accordance with minimum configuration requirements.

#### 4.2

##### NASA Initiated Change

New and/or revised data requirements will be incorporated by contract modification to which the new or revised DRL and/or DRD will be appended. The contractor shall notify the contracting officer in the event a data requirement is imposed by a contract modification and for which no DRL change page is appended. In such a case, the contracting officer will submit the required DRL/DRD changes, unless the data is a "one-time" requirement. Nothing herein shall be construed to relieve the contractor of the responsibility to furnish data under the provisions of any contract modification in the event the appropriate DRL change pages are not appended or otherwise furnished.

DRL change identification will be accomplished by controlling each DRL page separately and by placing a change control symbol and date in the revision block at the top of each DRL page.

#### 4.3

##### Contractor Initiated Change

Contractor proposed data requirements, or proposed changes to existing requirements, shall be presented on a company controlled Document Change Notice (DCN).

Associated costs for preparing DCN's in response to JSC contract modifications will be evaluated and negotiated as an integral part of the modification authorizing the change.

#### 5.0

##### ORDER OF PRECEDENCE

Where requirements of this Data Management Specification and the requirements of a DRD or the DRL conflict, the following order of precedence shall prevail:

- a. DRL
- b. DRD
- c. Data Management Specification

6.0 PEP PROJECT BASELINE DATA REQUIREMENTS

- 6.1 The baseline (minimum) documentation/information that the Contractor shall furnish is delineated in the various sections that follow. Specific DRD's have been defined for each item on the DRL. However, the Contractor is encouraged to further define the data requirements to more fully utilize his internal documentation system and to reduce the cost of data.

ATTACHMENT NUMBER		RESPONDENT			
EXHIBIT NUMBER		PREPARATION DATE:			
CONTRACT/RFP NUMBER		PAGE 1 of 2			
DRL NUMBER		REVISION			
1 LINE ITEM NO.		2 DRD NUMBER		3 PROJECT/SYSTEM	
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JSC DATA REQUIREMENTS LIST (ORL) (CONTINUATION SHEET)			ORL NUMBER	REVISION	PAGE 2 of 2
5	MA-05	Report, Monthly Financial Management		2	See 9
Cutoff date is last day of Contractor's accounting month; first submittal is 10 days thereafter. Reference: NHB 9501.1A.					
6	MA-06	Report, Quarterly Financial Management		2	See 9
Cutoff date is last day of Contractor's accounting month. First submittal is 20 days after cutoff in 4th month after ATP.					
7	MA-07	Report, Monthly Progress		2	See 9
Cutoff is last day of accounting month. First submittal due 15 days thereafter in 1st month of performance. Reference: Statement of Work: Para.					
8	MA-08	Plan, GFP Maintenance		1	See 9
First submittal due 30 days after ATP. Subsequent revisions to be submitted as released. Approval to overall Contractor property management system negats requirement for separate submittal. Reference: GFP Clause of Contract					
9					
<div style="text-align: right;">NASA-JSC</div>					

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER -  
		LINE ITEM NUMBER - <b>MA-01</b>
1. TITLE <b>Plan, Project Management</b>		2. NUMBER  
		4. DATE  
3. USE To provide a description of the Contractor's methods for accomplishing the program requirements.		5. ORGANIZATION  
		6. REFERENCES  
		7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u> This DR establishes the content, format, maintenance, and submittal requirements for a Management Plan. The Plan shall be summary in nature with references to the Contractor's internal procedures, and shall describe the Contractor's concept, plans, practice, and approach for accomplishing (i.e., managing and controlling) project tasks, management interfaces, time phased relationships of tasks and program elements, and the criteria against which performance may be judged.		
8.2 <u>APPLICABLE DOCUMENTS</u> None required.		
8.3 <u>CONTENT</u> The document shall consist of an index of the Contractor's internal operating plan and directives and procedures for each of the following areas with brief discussions as to how they will be utilized in managing the project: <ul style="list-style-type: none"> <li>A. Project Management</li> <li>B. Engineering Management</li> <li>C. Manufacturing Management</li> <li>D. Performance Management</li> <li>E. Information Management</li> <li>F. Government Furnished Property Management</li> <li>G. Procurement Management</li> <li>H. Quality Assurance Management</li> <li>I. Configuration Management</li> </ul>		
8.4 <u>FORMAT</u> The plan shall be sectionalized to cover the elements specified in Paragraph 8.3 above. The Contractor's own format shall be satisfactory. Sketches, drawings, photographs and tables shall be used when practical.		
8.5 <u>MAINTENANCE</u> The plan shall be maintained current by page revision or complete reissue to reflect all approved program changes that effect this plan.		



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER -  LINE ITEM NUMBER - <b>MA-02</b>
1. TITLE  <b>Expanded Contract Work Breakdown Structure (WBS) and Dictionary</b>	2. NUMBER  4. DATE	
	5. ORGANIZATION  6. REFERENCES 1) WBS 2) All Plans 7. INTERRELATIONSHIP	
3. USE To display and define the products and services to be developed or furnished by the Contractor for optimum management of the program.		
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u> This DR establishes the content, format, maintenance, and submittal requirements for the Expanded Contract Work Breakdown Structure (WBS) and Dictionary. The WBS shall subdivide the contractual work to be accomplished into elements that serve as the basis for detailed planning and control, and to permit collection of cost and schedule data for each element.		
8.2 <u>APPLICABLE DOCUMENTS</u> None required.		
8.3 <u>CONTENTS</u> The WBS shall subdivide the project into elements that serve as a basis for detailed planning and control of the project and shall include hardware, software, facilities, services, management systems, etc. The WBS shall consist of three to five levels of increasing detail. Additional levels shall be utilized as required by contract. Lower detail, which the Contractor utilizes for its own management purposes to validate information reported to NASA, shall be compatible with NASA requirements.		
8.4 <u>FORMAT</u> The WBS shall consist of: A. An indented list of element titles B. A narrative dictionary defining the scope of each element or the types of tasks included in each element C. A diagram to indicate element relationships more clearly.		
8.5 <u>MAINTENANCE</u> The WBS shall be updated to reflect contract changes as they affect the WBS coverage. Revisions shall be accomplished by change pages.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DR NUMBER -  
1. TITLE  Plan, New Technology		LINE ITEM NUMBER - MA-03
3. USE To provide the Contractor's plan for compliance with the New Technology Statement of Work.		2. NUMBER  
		4. DATE  
		5. ORGANIZATION  
		6. REFERENCES  
		INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u> This DR establishes the requirements for the contents, format, maintenance and submittal of a plan for the management and evaluation of technical work to identify presence of inventions and new innovations for patent purposes, as defined in the New Technology Clause of the contract.		
8.2 <u>APPLICABLE DOCUMENTS</u> None required.		
8.3 <u>CONTENT</u> The plan shall contain the Contractor's approach to: A. A management concept to adequately report new technology. B. Early identification of new technology. Forms and other documentation formats to be used shall be stipulated. C. Exercising control over subcontractor compliance.		
8.4 <u>FORMAT</u> The Plan shall be presented in narrative format.		
8.5 <u>MAINTENANCE</u> The Plan shall be maintained in a current condition by page replacement or complete re-issue to reflect the latest approved program changes.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		ORL NUMBER -  
		LINE ITEM NUMBER - <b>MA-04</b>
1. TITLE  <b>Schedules, Project</b>		2. NUMBER  
		4. DATE  
3. USE To provide Government and Contractor decision points, interfaces, and interactions relative to the project.		5. ORGANIZATION  
		6. REFERENCES  
		7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u> This DR establishes the content, format, maintenance, and submittal requirements for the Project Schedules. The Project Schedules shall be prepared to direct the period of performance for that work specified in the Work Breakdown Structure and to portray significant project milestones necessary to measure, analyze and perform corrective actions as necessary.		
8.2 <u>APPLICABLE DOCUMENTS</u> None required.		
8.3 <u>CONTENTS</u> The Project Schedules shall be keyed to the PEP Delivery Schedules and provide supplementary information at the project level. The Schedules shall present the Contractor's overall plan for accomplishment of tasks to meet the basic objectives of the PEP project. The Schedules shall display a time-phased, traceable flow from ATP through tooling design, start of fabrication, major procurements, manufacturing activity, preparation for shipment and delivery to the F.O.B. point.		
8.4 <u>FORMAT</u> The Schedules shall be prepared in Gantt Chart format, and shall be compatible with the applicable WBS.		
8.5 <u>MAINTENANCE</u> The Schedules shall be maintained current to reflect the most recent program requirements.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		ORL NUMBER -  LINE ITEM NUMBER - MA-05
1. TITLE Report, Monthly Financial Management		2. NUMBER  4. DATE
3. USE To provide the Government with monthly accumulated expenditure for monitoring program costs.		5. ORGANIZATION  6. REFERENCES  7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u> This DR establishes the requirement for the preparation and submittal of the Monthly Financial Management Report, Form 533M, required by NMI 9501.1A.		
8.2 <u>APPLICABLE DOCUMENTS</u>  NHB 9501.2A. NMI 9501.1A		
8.3 <u>CONTENTS</u>  The report shall present accumulated expenditures, resulting from contractual efforts. The contents shall be as specified in NASA Handbook 9501.2A. Subsequent changes and/or addition of cost elements to be reported shall be determined between the Government and the Contractor. The Contracting Officer will notify the Contractor of each change and addition and the reporting period of which each shall apply.		
8.4 <u>FORMAT</u>  The 533M report shall be prepared per NHB 9501.2A.		
8.5 <u>MAINTENANCE</u>  None required.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER  
		LINE ITEM NUMBER <b>MA-06</b>
1. TITLE  <b>Report, Quarterly Financial Management</b>		2. NUMBER  
		4. DATE  
3. USE  <b>To provide the Government with forecast expenditures required to complete the contractual effort.</b>		5. ORGANIZATION  
		6. REFERENCES  
		7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u>  This DR establishes the requirement for the preparation and submittal of the Quarterly Financial Management Report, Form 533Q, required by NMI 9501.1A.		
8.2 <u>APPLICABLE DOCUMENTS</u>  NHB 9501.2A NMI 9501.1A		
8.3 <u>CONTENTS</u>  The report shall forecast expenditures required to complete the contractual effort. The contents shall be as specified in NASA Handbook 9501.2A. Subsequent changes and/or addition of cost elements to be reported shall be determined between JSC and the Contractor. The Contracting Officer will notify the Contractor of each change and addition and the reporting period to which each shall apply.		
8.4 <u>FORMAT</u>  The 533 Quarterly Report shall be prepared per NHB 9501.2A.		
8.5 <u>MAINTENANCE</u>  None required.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER - LINE ITEM NUMBER - <b>MA-07</b>
1. TITLE <b>Report, Monthly Status</b>		2. NUMBER 4. DATE
3. USE To provide visibility of significant events occurring during the reporting period and status of contract schedule milestones and other significant areas within technical and administrative disciplines.		5. ORGANIZATION 6. REFERENCES 7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u> This DR establishes the requirements for the preparation of a monthly progress letter and status report giving a brief description of technical and administrative progress and status in major and significant activities leading to the accomplishment of contractual objectives and correction of problem areas.		
8.2 <u>CONTENT</u> The report shall include, as a minimum, the following information: <ul style="list-style-type: none"> <li>A. A discussion of the technical and programmatic analyses and studies conducted during the reporting period. The presentation shall be in sufficient depth and detail to permit evaluation of progress. Supporting data in the form of charts, graphs, schematics, etc., may be included as appropriate.</li> <li>B. A discussion of the scheduling for the reporting period, including a comparison of the planned work and milestones for the reporting period versus actual accomplishments. Include identification of deviations from the planned work in sufficient detail to provide clear visibility as to the cause and corrective action.</li> <li>C. A discussion covering man-hours expended during the reporting period, and expenditures in man-hours during the contract performance. This presentation shall be in chart form.</li> <li>D. A discussion of the planned effort for the next two months following.</li> </ul>		
8.3 <u>FORMAT</u> The arrangement of the technical portion of the report shall correspond with the task breakdown of the Statement of Work. A separate section shall be included to report on administrative matters and overall study status. Reports shall be in letter form.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER -  
		LINE ITEM NUMBER - MA-08
1. TITLE Plan, Government Furnished Property Maintenance		2. NUMBER  
		4. DATE  
3. USE To describe the Contractor's method of controlling and maintaining Government Furnished Equipment (GFE)		5. ORGANIZATION  
		6. REFERENCES  
		7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 3.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u>  This DR establishes the content, format, maintenance, and submittal requirements for the Government Furnished Property Maintenance Plan.		
8.2 <u>APPLICABLE DOCUMENTS</u>  NASA Procurement Regulation Appendix B, "Control of Government Property in Possession of Contractors".		
8.3 <u>CONTENT</u>  The Plan shall satisfy the requirements of NASA Procurement Regulation Appendix B, and shall consist of those procedures which constitute the Contractor's Property Management Manual.		
8.4 <u>FORMAT</u>  The Contractor's internal format shall be used.		
8.5 <u>MAINTENANCE</u>  The Plan shall be maintained in a current condition by page replacement or complete re-issue to reflect the latest approved program changes. Should this Plan be part of the Contractor's Property Management Manual, submittal of the manual will suffice, assuming the Contractor's Property Management System is approved.		

ATTACHMENT NUMBER		1		RESPONDENT.	
EXHIBIT NUMBER		2		PREPARATION DATE:	
CONTRACT/REP NUMBER		3		PAGE 1 of 3	
URL NUMBER		4		REVISION:	
PROJECT/SYSTEM		5		7 FREQ. OF SUBM.	
OSM/Power Extension Package Project		6		JSC DOCUMENT NUMBER	
TITLE		7		INITIAL OF SUBMITTAL	
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JSC DATA REQUIREMENTS LIST (ORL) (CONTINUATION SHEET)				ORL NUMBER	REVISION	PAGE
1	2	3	4	5	6	7
5	CM-05	Report Configuration Verification Accounting	-	3	-	AR See 9
With each end item delivery, furnish one copy						
6	CM-06	Modification Package	-	2	-	RT See 9
One time per hardware change (kit)						
7	CM-07	Retrofit/Mod Installation Verification & Closure	-	2	-	AR See 9
Furnish one copy with CM-06						
8	CM-08	Request Deviation/Waiver	-	1	-	RT See 9
All applicable waiver requests shall be made a part of each acceptance data package						
9	CM-09	Specification-Contract Flight Item	-	1	-	RT See 9
Draft flight item spec to be received by NASA 15 days prior to PDR. Final draft (original) to be received 15 days after PDR. NASA approval 21 days from receipt of final draft						



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER - LINE ITEM NUMBER - CM-01
1. TITLE Engineering Configuration List (ECL)		2. NUMBER 4. DATE
3. USE To provide the "as-designed" data for comparison with the "as-built" data as required by the accounting and verification system.		5. ORGANIZATION 6. REFERENCES JSC 07700 Vol. IV 7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		

8. PREPARATION INFORMATION

8.1 Scope

This DR establishes the content, format, maintenance, and submittal requirements for Engineering Configuration Lists. An ECL will contain a summary of the Contractor's part numbers currently released for a specific contract item unit.

8.2 Applicable Documents

JSC 07700, Volume IV Configuration Management

8.3 Content

The list will be in part numbers sequence and will include the following data for each part listed.

1. Part number
2. Latest drawing change letter for that part
3. Part name
4. Quantity
5. Next assembly part number

8.4 Format

See 8.3 above.

8.5 Maintenance

TBD

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER
		LINE ITEM NUMBER CM-02
1. TITLE  As-Built Configuration List (ABCL)		2. NUMBER
		4. DATE
3. USE  To provide the "as-built" data for comparison with the "as-designed" data as required by the accounting and verification system.		5. ORGANIZATION
		6. REFERENCES JSC 07700 Volume IV
		7. INTERRELATIONSHIP

*(The Center Data Manager (Code JM2) will assign numbers in block 2.)*

**8. PREPARATION INFORMATION**

**8.1 Scope**

An ABCL is prepared by the Contractor for each CI. It is the documented and verified identification and physical description of the CI manufactured by the Contractor for acceptance and delivery to NASA/JSC. The ABCL consists of an accurate accumulation of data extracted from the fabrication and test records, as certified by inspection records. Listing of common parts (i.e., nuts, bolts, washers, etc.), is not required unless these parts are in themselves critical or special application hardware or if parts require traceability.

**8.2 Applicable Documents**

None

**8.3 Content**

The following specific elements of data shall be provided.

1. CI identification by part number, nomenclature, and serial number.
2. Acceptance Test Procedure (ATP) specification, including revision letter or number and date of specification used to certify a deliverable CI.
3. The "as-built" record consisting of a parts list of the completed CI as fabricated and tested by Manufacturing and certified by inspection records. This record shall also include record of authorized major deviations or waivers by part number.
4. The change letter (drawing revision letter) to which the part, component, assembly was fabricated.
5. Serial number, lot number, etc. of traceable parts, as required by engineering data shall be listed where appropriate.

### 8.3 CONTENT (Continued)

6. The controlled procedures/processes/methods utilized to fabricate, assemble, test and inspect the CI.
7. Inspection Verification Signature. This signature shall verify the accuracy of the total data covering the item delivered.

### 8.4 FORMAT

The Contractor's internal forms will be acceptable to satisfy this requirement provided it contains the above data.

However, the format of the ABCL must be compatible with the format selected for the Engineering Configuration List (ECL) (CM-01) Baseline to allow a rapid comparative analysis. The cover sheet for the ABCL shall specify the following:

1. ABCL identification number and nomenclature of the CI.
2. Contractor's top assembly part number and serial number of the CI for which the data applies.
3. Inspection verification signature and date.
4. Number of pages (i.e., Page 1 of \_\_\_ pages).

If the Contractor elects to provide a second page of the cover sheet to list the controlled processes, materials, procedures, methods, and support test documentation for the ECL, the ABCL shall be of the same format.

### 8.5 MAINTENANCE

TBD

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DR. NUMBER - LINE ITEM NUMBER - CM-03
1. TITLE  Engineering Change Proposal		2. NUMBER  4. DATE
3. USE  To document contractor proposed Class I engineering changes to approved baselines for submittal to the PEP Project Office.		5. ORGANIZATION  6. REFERENCES  7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		

8. PREPARATION INFORMATION

8.1 Scope

All baseline changes proposed by the Contractor requiring NASA approval shall be documented on an Engineering Change Proposal (ECP). The Contractor may use his own ECP format, but must provide, as a minimum, the following data:

- A. Change title, date, and PCIN (assigned by the Level II PRCB Secretary).
- B. Change description.
- C. Change impact.
- D. Cost of change (including cost per flight and DDT&E cost).
- E. Effectivity.
- F. Effects on specifications, drawings, ICD's, etc.
- G. Justification and reason for the change.
- H. Schedule impact.
- I. Incorporation location.
- J. Impact on disciplines such as safety, reliability, quality assurance, test, operations, logistics, etc.

8.2 Format

Contractor's own ECP format or JSC Form \_\_\_\_\_.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		REL NUMBER - LINE ITEM NUMBER - <b>CM-04</b>
1. TITLE  <b>Plan, Configuration Management</b>	2. NUMBER  4. DATE	5. ORGANIZATION  6. REFERENCES <b>JSC 07700 Volume IV</b>
3. USE  To describe the Contractor's organization as it relates to configuration management, the procedures for identifying and documenting the configuration items; and how changes will be controlled.		7. INTERRELATIONSHIP
(The Center Data Manager (Code IN2) will assign numbers in block 2.)		

8. PREPARATION INFORMATION

8.1 Scope

This DR establishes the requirements for preparation of a Configuration Management Plan.

8.2 Applicable Documents

None

8.3 Content

As a minimum, the Configuration Management Plan will contain the following:

Organization - The Contractor shall describe the organizational relationship of his configuration management to total project management. He should define the authority/responsibility of the key organizational elements impacted by requirements for configuration management.

Baseline Identification - The Contractor shall describe the method for identifying the baseline and the documentation (specifications, drawing practices, engineering release system, etc.) used to depict the requirements and baseline.

Control - The Contractor shall describe the methods, procedures, and policies used (or to be used) within his organization for establishing and controlling baselines. This portion of the plan should address technical and management interface activities with other Shuttle elements and contractors.

Accounting - The Contractor shall describe his accounting system.

Verification - The Contractor shall describe his verification system.

Subcontractor/Vendor Configuration Management Control - The Contractor shall indicate the proposed methods and level of control over subcontractors and vendors.

Program Phasing - The Contractor shall describe his plans for conducting/ supporting Project reviews.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER - LINE ITEM NUMBER - <b>CM-05</b>
1. TITLE  <b>Report - Configuration Verification Accounting System</b>		2. NUMBER  4. DATE
3. USE  To identify the configuration baseline for each deliverable item including incorporation status of all approved engineering changes, deviations, waivers, and contract noncompliances.		5. ORGANIZATION  6. REFERENCES  7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		

**C. PREPARATION INFORMATION**

**2.1 Scope**

The Configuration Verification Accounting System Report shall contain the following:

1. Complete record of approved configuration for each deliverable item.
2. All Class I and Class II changes and all deviations and waivers to the approved configuration, corresponding manufacturing records and field modifications throughout the manufacturing cycle of the end item.
3. Verification data information on records within the Contractor's integrated records system. These records shall be described in the Contractor's Quality Program Plan.
4. Status of NASA/JSC approved Class I changes, and major deviations and waivers, including status of incorporation (including closure) in each deliverable item.
5. Contractor internal status of pending Class I changes, and major deviations and waivers which the Contractor plans to submit to NASA/JSC.
6. Status and accountability of contract noncompliance (including closure).



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER - LINE ITEM NUMBER - <b>CM-06</b>
1. TITLE <b>Modification Package</b>		2. NUMBER 4. DATE
3. USE To provide instructions for accomplishment of modifications to delivered hardware.		5. ORGANIZATION 6. REFERENCES 7. INTERRELATIONSHIP <b>CM-08</b> <b>SL-T-0010</b>
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION <b>8.1 Scope</b> The modification package shall include as a minimum: <ul style="list-style-type: none"> <li>A. PRCB/CCB Directives</li> <li>B. CEI and Serial Number(s)</li> <li>C. Parts/Material List</li> <li>D. Modification Instructions</li> <li>E. Engineering Requirements (drawing/engineering order)</li> <li>F. Completion and Notification Records</li> <li>G. Modification Package Identification with PCIN Reference</li> <li>H. Installation location and recommended incorporation period</li> <li>I. Modification Package Hardware</li> <li>J. Spare action required</li> <li>K. Disposition removed/replaced parts</li> <li>L. Special tools/fixtures required</li> <li>M. Retest requirements as released engineering</li> <li>N. Operational/maintenance manuals affected</li> <li>O. ECP Identification Number</li> </ul>		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		ORL NUMBER - LINE ITEM NUMBER - <b>CM-07</b>
1. TITLE <b>Cards, Modification Installation Notice (ICN)</b>	2. NUMBER 4. DATE	5. ORGANIZATION 6. REFERENCES <b>CM-07</b> <b>SL-T-0010</b>
3. USE <b>To provide official notification of completion of every retrofit modification and noncompliance.</b>	7. INTERRELATIONSHIP	
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		

8. PREPARATION INFORMATION

8.1 Scope

Modification Installation Notices shall contain the following minimum information:

Mod. Kit Installation

Contract Item Number  
 Serial Number  
 ECP  
 Mod. Kit Number  
 Work Order Number  
 Installed by  
 Inspected by  
 Remarks

Mod. Kit Validation

Contract Item Number  
 Serial Number  
 ECP  
 Mod. Kit Number  
 Test Location/Identification  
 Test Organization  
 Inspected by

8.2 Format

In the absence of a JSC form, the Contractor may use existing internal form to satisfy this data requirement.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER -
		LINE ITEM NUMBER - <b>CM-08</b>
1. TITLE  <b>Request - Deviation/Waiver</b>	2. NUMBER	
	4. DATE	
3. USE  To document and submit Contractor proposed major deviations and waivers.	5. ORGANIZATION	
	6. REFERENCES <b>JSC 07700 Volume IV</b>	
	7. INTERRELATIONSHIP	
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION.		
<b>8.1 <u>Scope</u></b>  Deviations and waivers which fall within the definitions of "Class I" changes shall be processed through the appropriate CCB in the same manner as any other Class I change. The Level II change request will be designated as "deviation" when the request is for a specific authorization to be granted <u>before</u> the fact to depart from a particular specification requirement. The Level II change request will be designated as "waiver" when the request is for the granted use or acceptance of an article which does not meet specified requirements: a waiver is given or authorized <u>after</u> the fact.		
<b>8.2 <u>Format</u></b>  Contractor's format may be utilized.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		ORL NUMBER -  														
		LINE ITEM NUMBER - <b>CM-09</b>														
1. TITLE  <b>Specification - PEP Flight System</b>		2. NUMBER  														
		4. DATE  														
3. USE  <b>To establish the performance, design, development and test requirements for flight items.</b>		5. ORGANIZATION  														
		6. REFERENCES  <b>JSC 07700 Volume IV</b>														
		7. INTERRELATIONSHIP  														
(The Center Data Manager (Code JM2) will assign numbers in block 2.)																
8. PREPARATION INFORMATION																
<b>8.1 Scope</b>  This DR establishes the content, format, maintenance, and submittal requirements for the overall PEP flight system specification.																
<b>8.2 Format and Content</b>  All specifications deliverable to JSC require rigid major paragraph numbering and title control, unless less stringent requirements defined in IRD's have been approved. Limited format control for specifications shall be exercised to the extent specified by this paragraph and its subparagraphs. Major paragraphs shall be numbered and titled as follows:																
<table border="0"> <tr> <td>1.0 SCOPE</td> <td>(Section 1)</td> </tr> <tr> <td>2.0 APPLICABLE DOCUMENTS</td> <td>(Section 2)</td> </tr> <tr> <td>3.0 REQUIREMENTS</td> <td>(Section 3)</td> </tr> <tr> <td>4.0 VERIFICATION</td> <td>(Section 4)</td> </tr> <tr> <td>5.0 PREPARATION FOR DELIVERY</td> <td>(Section 5)</td> </tr> <tr> <td>6.0 NOTES</td> <td>(Section 6)</td> </tr> <tr> <td>10.0 APPENDIX</td> <td>(Section 10)</td> </tr> </table>			1.0 SCOPE	(Section 1)	2.0 APPLICABLE DOCUMENTS	(Section 2)	3.0 REQUIREMENTS	(Section 3)	4.0 VERIFICATION	(Section 4)	5.0 PREPARATION FOR DELIVERY	(Section 5)	6.0 NOTES	(Section 6)	10.0 APPENDIX	(Section 10)
1.0 SCOPE	(Section 1)															
2.0 APPLICABLE DOCUMENTS	(Section 2)															
3.0 REQUIREMENTS	(Section 3)															
4.0 VERIFICATION	(Section 4)															
5.0 PREPARATION FOR DELIVERY	(Section 5)															
6.0 NOTES	(Section 6)															
10.0 APPENDIX	(Section 10)															
<b>8.2.1 Major Paragraphs Content.</b>  Standard Contractor Configuration Management Requirements, and MIL-STD-490, Specification Practices, should be used as a guide for information and data to be contained within these paragraphs. Where no information is pertinent, state, "This section is not applicable to this specification."																
<b>8.3 Subdivision of Major Paragraphs</b>  Major paragraphs/sections should be broken down into as many paragraphs and subparagraphs as are required to clearly define the requirements.																

#### 8.4 Paragraph Numbering

Each paragraph and subparagraph shall be numbered consecutively within each major paragraph/section of the specification, using a period to separate the number representing each breakdown. An example is shown below:

REQUIREMENTS	3.0
First Paragraph	3.1
First Subparagraph	3.1.1
Second Paragraph	3.2
etc.	

Itemization within a paragraph or subparagraph shall be identified by lower case letters.

#### 8.5 Paragraph Identification/Title

Where practicable, all paragraphs and subparagraphs should be given a subject identification. It is not mandatory to use the same numbers and subject identifications for paragraphs and subparagraphs as shown in MIL-STD-490 under major paragraphs/sections. All subject identifications for major paragraphs and breakdown paragraphs and subparagraphs shall be underlined.

Title Page. The minimum data elements that shall be shown on the title page for CEI specifications are as follows:

- A. Specification Number and Revision Letter
- B. Date Released
- C. Type of Specification
- D. Title/Nomenclature for the Specification
- E. Approved Program/Project Nomenclature Identity
- F. CEI Number (as applicable)
- G. Manufacturer's Code ID Number
- H. Preparing Activity Approval Signature and Date
- I. NASA Office Approval Signature and Date
- J. Contract Number

#### 8.6 Maintenance

See DRD CM-10.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER -
1. TITLE  Specification - Change Notice and Revisions		LINE ITEM NUMBER - CM-10
		2. NUMBER
		4. DATE
3. USE  To document proposed changes to the contract specifications described in DRD CM-09 and CM-11		5. ORGANIZATION
		6. REFERENCES
		7. INTERRELATIONSHIP

(The Center Data Manager (Code JM2) will assign numbers in block 2.)

8. PREPARATION INFORMATION

8.1 Scope

Contractor's may use their own forms for the Specification Change Notice (SCN) change log, and configuration charts provided they contain the minimum data required by JSC Forms \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER -  
		LINE ITEM NUMBER - <b>CM-11</b>
1. TITLE  <b>Specification - Ground Support Equipment</b>		2. NUMBER  
		4. DATE  
3. USE  <b>To establish, in one document, the performance, design, development and test requirements for all ground support equipment.</b>		5. ORGANIZATION  
		6. REFERENCES  <b>JSC 07700 Volume IV</b>
		7. INTERRELATIONSHIP  
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION  <b>8.1 <u>Scope</u></b>  The specification documents the functions of the set of GSE and translates these functions into GSE requirements including test requirements. Each separate item will be identified and its requirements specified.		
 <b>8.2 <u>Style and Format</u></b>  Style and format shall be in accordance with the intent of MIL-STD-490.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER - LINE ITEM NUMBER - <b>CM-12</b>
1. TITLE <b>Specification, Environmental</b>		2. NUMBER 4. DATE
3. USE <b>To update environmental data for the designated testing of PEP</b>		5. ORGANIZATION 6. REFERENCES <b>JSC07700, Vol XIV          JCD2-19001</b>
		7. INTERRELATIONSHIP

(The Center Data Manager (Code JM2) will assign numbers in block 2.)

#### 8. PREPARATION INFORMATION

##### 8.1 SCOPE

This DR updates the limits of environmental conditions to which the Power Extension Package equipments may be exposed.

##### 8.2 APPLICABLE DOCUMENTS

JSC 07700, Volume XIV

Level II Program Definition and Requirement, Volume XIV - Space Shuttle System Payload Accommodations

JCD 2-19001

Shuttle Orbiter/cargo Standard Interfaces Level II Program Definition and Requirements - Volume XIV, Attachment 1.

##### 8.3 CONTENT

The contents of this document will include both natural environments and orbiter induced environments for ground and space conditions.

Ground natural environments will consider transportation (packaged) and storage conditions. Ground induced environments will include a definition of bay air purge conditions.

Space natural environments will consider pressure, meteoroids and thermal and ionizing radiation.

Orbiter induced environments include thermal, limit-load factors/angular accelerations, acoustics, vibration, on-orbit accelerations, bay particulates and gases and electromagnetic interference environments.

##### 8.4 FORMAT

The format of this DR will be as follows:

1. Introduction
2. Documentation



#### 8.4 FORMAT (Continued)

##### 3. Natural Environments

- A. Ground Natural Environments
- B. Space Natural Environments

##### 4. Induced Environments

- A. Thermal Environments
- B. Limit-load Factors/Angular Accelerations
- C. Acoustics
- D. Vibration
- E. On-orbit Accelerations
- F. Orbiter/cargo bay particulates and gases environments
- G. Electromagnetic interference environment

ATTACHMENT NUMBER		RESPONDENT			
EXHIBIT NUMBER		PREPARATION DATE:			
CONTRACT/RFQ NUMBER		PAGE 1 of 2			
ORL NUMBER		REVISION			
PROJECT/SYSTEM		OSM/Power Extension Package (PEP) Project			
3		TITLE			
2		3			
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1		6			
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JSC DATA REQUIREMENTS LIST (DRL) (CONTINUATION SHEET)			DRL NUMBER	REVISION	PAGE 2 of 2
5	LS-05	List, Approved Spare Parts			See 9
Initial submittal of CEI, DCR.					
6	LS-06	List, PEP Support Equipment			See 9
Initial submittal due 60 days prior to CDR.					
7	LS-07	Analysis, Support Requirements			See 9
Initial submittal due 90 days after ATP.					
8	LS-08	Forecast, Liquids, Gases and Chemicals - 5 Mo.			*
* See DR for frequency and submittal requirements.					

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		LINE NUMBER LINE ITEM NUMBER LS-01
1. TITLE Power Extension Package Logistics Plan (PEPOLP)		2. NUMBER 4. DATE
3. USE To provide NASA and Contractor Management and Operations personnel with an implementation plan covering all logistics functions necessary to support PEP kit, integration, prelaunch, launch, flight, and post landing operations.		5. ORGANIZATION 6. REFERENCES 7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 SCOPE This DR establishes requirements for assessing and the implementation of the logistics effort required to support the PEP program.		
8.2 APPLICABLE DOCUMENTS Space Shuttle Logistics Requirements, JSC 07700, Vol. XII. KSC, Space Transportation System, Integrated Logistics Support Plan, K-SM-12.0, July 8, 1975.		
8.3 CONTENTS The Power Extension Package Operations Logistics Plan (PEPOLP) shall describe all of the logistics functions that must be implemented to support PEP integration, prelaunch, launch, flight and post-flight operations. The PEPOLP shall describe how the Contractor will accomplish each task and give schedules with time phasing relationships for each. Also, the PEPOLP shall clearly describe interfaces with NASA, or their contractors and indicate the specific products or services involved in the interface. Initiative and ingenuity shall be demonstrated in developing the PEPOLP to provide for PEP program life cycle cost effectiveness in logistics implementation.  The PEP shall include (but not be limited to) the Contractor's planning for products and services required to implement the following logistics functional areas:  A. Support Requirements Analysis (SRA) (Ref. DR LS-07)  This section shall describe the procedures and techniques to be used in assessing the support available from NASA or their contractors and determining the remaining logistics products and services to be provided/performed in implementing the PEPOLP.  B. Optimum Repair Level Analysis (ORLA)  This section shall describe the procedures and techniques to be used in performing analyses and determining the optimum repair levels for all PEP hardware provided under this SOW.		

### 8.3 CONTENTS (cont'd)

#### C. Maintainability (M) (Ref. DR LS-02)

This section describes the effort and procedures for assessment of the maintainability implementation and describes the requirements to be implemented in the design of PEP flight equipment and GSE provided under this SOW.

#### D. Maintenance

This section shall describe the Contractor's plan for implementing organizational, intermediate, and depot maintenance actions. The plan shall clearly show interfaces with other organizations and how status tracking, expediting, or other actions will be accomplished. The plan shall consider the most cost effective utilization of existing maintenance capabilities to avoid unnecessary duplications.

#### E. Spares Provisioning (Ref. DR LS-05)

This section shall describe the plan for development of spares provisioning data for all PEP hardware developed under this SOW. Describe the Contractor's effort in spares provisioning, warehousing, and inventory management showing interfaces where appropriate.

#### F. Fuels, Pressurants, and Fluids (Ref. DR LS-08)

This section shall describe the Contractor's efforts in identifying the types and quantities of fuels, pressurants, and other fluids needed for each PEP operational activity. The effort shall include the Contractor's participation in forecasting requirements and reporting usage data.

#### G. Operations and Maintenance Documentation (O&MD) (Ref. DR LS-04)

This section shall describe the plan for assessing the adequacy and completeness of operations and maintenance documentation to support the PEP operational functions. The plan will also identify how the Contractor will acquire or develop other operations and maintenance procedures, manuals, or instruction needed to support planned operations.

#### H. Preservation, Packaging, and Packing (P/P/P)

This section shall describe the Contractor's efforts to provide preservation and packaging for spares and equipment. Include description of utilization of packaging specifications provided by equipment designers/developers and approaches to development of packaging specifications for items not covered by equipment supplier documentation. Show interfaces with other NASA or contractor organizations in the implementation of these activities.

### 8.3 CONTENTS (cont'd)

#### I. Transportation (Ref. DR LS-03)

This section shall describe the Contractor's efforts in planning and implementing transportation and handling of equipment to assure support to PEP program operations functions and to assure safety of equipment and personnel. Include a description of traffic management system for scheduling and monitoring delivery of equipment to meet operational need dates in the most cost effective manner. Show operational transportation interfaces.

#### J. Storage Criteria

This section shall describe the pre-storage or preparation-for-storage requirements, and the post-storage preparation necessary to place the stored item into operational status for hardware provided under this SOW.

#### K. Logistics Management

This section shall contain a management plan for control of technical performance, cost, and scheduling of the logistics effort required to support all flights that include PEP.

#### L. Training (Ref. DR's TS-01, 02, 03)

This section shall describe the procedures to be implemented in providing trained personnel for performance of the required logistics activities. Training courses, aids, descriptions available from other NASA or contractor sources shall be considered in optimizing the cost effectiveness of the training effort.

#### M. Logistics Facilities

This section shall describe the Contractor's efforts in establishing the requirements for Logistics Facilities related to PEP Operations and Maintenance (organizational intermediate and depot). The general approach must be to use existing facilities, both government and contractor, with a minimum of modifications in order to determine a least cost approach to logistics facility requirements.

Other areas of logistics operations may be included as separate sections at the discretion of the Contractor. Also, the Contractor may submit some of the above sections as separate plans (i.e., maintenance, training, transportation, etc.) with only references to separate plans being included in the SOLP.

Upkeep - The PEPOLP and any other documents submitted as separate plans under this DR shall be kept current and revised to reflect approved program changes.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DR NUMBER -  
		LINE ITEM NUMBER - <b>LS-02</b>
1. TITLE  <b>Plan, Maintainability Assurance</b>		2. NUMBER  
		4. DATE  
3. USE  <b>To define the Contractor's approach for maintainability of the CEI.</b>		5. ORGANIZATION  
		6. REFERENCES  
		7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u>  This DR established the Maintainability Assurance Plan for the CEI.		
8.2 <u>APPLICABLE DOCUMENTS</u>  None required.		
8.3 <u>CONTENTS</u>  The Plan shall define the planned method of accomplishing maintainability requirements and describe clearly and concisely how these requirements will be implemented. The Plan shall describe the procedures, policies, and closed-loop reporting system that will be used to implement maintainability for hardware developed under this SOW.		
8.4 <u>FORMAT</u>  The format of the plan may be determined by the Contractor as long as the content requirements of the Contents paragraph have been met.		
8.5 <u>MAINTENANCE</u>  As required.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DPL NUMBER - LINE ITEM NUMBER - LS-03
1. TITLE Transportation Plan		2. NUMBER 4. DATE
3. USE To aid in identification of packaging, materials handling and transportability requirements.		5. ORGANIZATION 6. REFERENCES 7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u> This DR establishes content requirements for a PEP Transportation Plan which shall be prepared and updated within (1) established engineering and design parameters for PEP hardware; and (2) constraints established by anticipated modes of transportation, methods of packaging, conditions of storage, international regulatory bodies, and regulating bodies of the United States.		
8.2 <u>APPLICABLE DOCUMENTS</u> None.		
8.3 <u>CONTENTS</u> The Transportation Plan shall:		
A. Identify packaging requirements required to protect hardware against physical and environmental damage during conditions of shipment, handling, and storage.		
B. Define the packaging, equipment, materials, and methods required to handle, preserve, package, pack, and ship CEIs, spares, and associated support equipment. Included shall be a description of how, and to what degree the program is responsive to test support, operational, and logistics follow-on requirements. Drawings or sketches of specialized packaging, handling, and protective equipment may be considered part of this data requirement when it becomes necessary or desired to describe an intended design approach or technique proposed for use.		
C. Describe briefly the internal management structure and functional inter-relationship involved in timely, effective, and economical packaging, handling, and transportability tasks.		
D. Include a milestone chart to identify transportability, packaging, and materials handling events depicting their projected time phased accomplishment in relationship to overall PEP milestones.		



### 8.3 CONTENTS (cont'd)

- E. Include a discussion of all transportability problem items which shall address, if applicable: (1) items requiring environmental controls or specially designed containers; (2) oversize, overweight, sensitive, and fragile items; and (3) dangerous and hazardous items.
- F. Describe all transportability problem items, if applicable, in terms of: (1) nomenclature; (2) approximate envelope size by length, width, depth; (3) approximate weight in kilograms; and (4) fragility rating.
- G. Generally describe by major categories all cargo which must be transported.
- H. Identify items, assemblies, or subassemblies that, because of inherent peculiarities, may be restricted in use to: (1) specific modes; (2) specialized equipment; (3) handling procedures; and/or (4) normal allowable limitations of existing or planned transportation systems.
- I. Identify regulatory agencies whose approval must be obtained prior to movement.
- J. Describe any special purpose carrier equipment and special services required to support the PEP project.
- K. Identify Contractor's office(s) of primary responsibility for usual or special transportation matters. Identification criteria shall include, as applicable: (1) office designation; (2) position; (3) title; (4) office phone; and (5) name, when appropriate.

### 8.4 FORMAT

The Plan shall be in narrative format and shall be arranged by major topics.

### 8.5 MAINTENANCE

The Plan shall be maintained current and revised to reflect approved program changes.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER -  LINE ITEM NUMBER - LS-04
1. TITLE  Manual, Operation and Maintenance (O&M)		2. NUMBER  4. DATE
3. USE  To provide detailed instructions for the operation and maintenance of equipment or system(s).		5. ORGANIZATION  6. REFERENCES  7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
6. PREPARATION INFORMATION  8.1 <u>SCOPE</u>  This DR establishes the content, format and maintenance requirements for technical manuals, which shall cover each Configuration End Item (CEI) and/or equipment as specified.		
8.2 <u>APPLICABLE DOCUMENTS</u>  None.		
8.3 <u>CONTENTS</u>  The manuals shall include the following:  A. Title Page  In addition to the manual title, this page shall depict the CEI numbers (as the model), the CEI detail specification identification number, the CEI part number, the manufacturer's identification and the design activity code identification number.		
B. Configuration Chart  Provide a configuration status chart, or equivalent display, in each manual. The chart shall relate the manual with its revisions and supplements to the configuration contained.		
C. List of Effective Pages  A list of effective pages shall be prepared and shall reflect all changes to the manual and provide a page by page inventory of the document.		

### 8.3 CONTENTS (cont'd)

#### D. Frontispiece

A frontispiece shall depict a 3/4 view of the equipment covered by the manual, depicting major dimensions and weight.

#### E. Table of Contents

A table of contents shall be provided.

#### F. List of Tables

A list of tables shall be provided.

#### G. Preface

The preface shall provide a brief explanation of the manual's purpose, including any relevant information that will assist in using the manual.

#### H. Body

The body of the manual shall be divided into the following parts arranged in the order as shown.

##### 1. Section I - General Information

This section shall provide the following:

- a. A complete description of the equipment and/or system. When the equipment covered consists of more than one major unit, this description shall be supplemented by a brief description of the physical characteristics of each major unit. Both illustrations and test shall be used to impart a general understanding of the physical characteristics and functions of the equipment.
- b. Detailed description (theory) of the operation of all hardware devices. Theory of operation of the various integrated and non-integrated circuits used in the device and in the printed circuits. Definition of interface functions with regard to timing, levels, and interrelationships.
- c. Definitions of technical terms, or terms not commonly used, when included in the text.
- d. Instructions covering the uncroting, assembly, installation, checkout, and servicing of equipment upon receipt.

##### 2. Section II - Operating Instructions

This section shall provide the following:

### 8.3 CONTENTS (cont'd)

- a. Detailed instructions for the proper operation of the equipment or system including, as applicable, tables and charts of operating data, performance specifications, warning notes, adjustments, and test procedures relating to the operation of the equipment or system.
- b. A basic description of the operation of the equipment.
- c. Safety requirement(s) for personnel and facilities.

#### 3. Section III - Maintenance Instructions

This section shall provide instructions for routine maintenance procedures, inspections, adjustments, cleaning, lubrication, procedures for locating trouble, making repairs, and replacing defective parts. Illustrations, charts, and tables may be employed in connection with these instructions.

NOTE: Manufacturer's information can be used. If necessary, material can be extracted verbatim for insertion into the manual.

#### 4. Section IV - Special Tools

This section shall contain a list of all special tools and equipment recommended by the Contractor for use in performing work described in the manual. The list shall be made up in columns with the following headings:

<u>PART NO.</u>	<u>NOMENCLATURE</u>	<u>FIGURE AND INDEX NO.</u>
-----------------	---------------------	-----------------------------

Tools and equipment shall be listed in numerical sequence by contractor and part number. Nomenclature shall be identical with that on drawings, with the addition of brief terms to show use when such information is lacking or not obvious. Illustrations of tools and equipment shall be provided when these items cannot be clearly identified on illustrations showing operating procedures.

#### 5. Section V - Schematic, Wiring, and Logic Diagrams

This section shall contain all schematic, wiring, and logic diagrams of the applicable system.

#### 6. Section VI - Handling

This section shall provide special handling instructions and procedures for disassembly, cleaning, preservation, packaging, and packing of components for storage or shipment.

#### 7. Section VII - Provision Parts Breakdown

This section shall consist of a group assembly parts list and a

### 8.3 CONTENTS (cont'd)

#### 7. Section VII (cont'd)

cross-reference alpha-numerical index of the articles, assemblies, and subassemblies that can be disassembled, reassembled, or replaced.

#### I. Appendix

The appendix shall be used to define terms used within the manual and shall contain information relevant, but not essential, to the material contained in the manual.

### 8.4 FORMAT

The manual shall be prepared in narrative format and shall be sectionalized according to the major topics outlined in the Contents paragraph. When a section does not apply, the section number and title, followed by the phrase "Not Applicable" shall be portrayed. The table of contents shall reflect the same information.

### 8.5 MAINTENANCE

The O&M Manuals shall be maintained current and when affected by approved program and/or hardware changes, shall be updated by change page and/or complete revision.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
 LYNDON B. JOHNSON SPACE CENTER  
 DATA REQUIREMENT DESCRIPTION

LINE ITEM NUMBER -
LS-05
2. NUMBER
4. DATE
5. ORGANIZATION
6. REFERENCES
7. INTERRELATIONSHIP
1) WBS
2) All Plans

List, Approved Spare Parts

To identify and account for approved spare parts as contractual items.

(The Center Data Manager (Code JM2) will assign numbers in block 2.)

EXPLANATION INFORMATION

8.1 SCOPE

This DR establishes the content, format and maintenance requirements for an alpha-numeric list which shall delineate spare parts furnished in support of a contract end item (CEI).

8.2 APPLICABLE DOCUMENTS

None required.

8.3 CONTENTS

The list shall include for each spare part, the following information:

- A. Part number (this shall include number assigned to the part as pertaining to a system, original manufacturer's model number or part number for non-standard parts).
- B. Part revision number
- C. Part nomenclature
- D. Part number and nomenclature of next higher assembly
- E. Number of spare parts to be provided
- F. Coding of parts to identify system or subsystem of which item is a part
- G. Estimated lead time for critical items
- H. Effectivity designation
- I. Repair code as follows:
  1. Non repairable
  2. Limited shelf life
  3. Requires scheduled maintenance

### 8.3 CONTENTS (cont'd)

- 4. Part of kit or set
- 5. Environmental
- 6. First level maintenance
- 7. Second level maintenance
- 8. Third level maintenance
- J. Spare parts code as follows:
  - 1. Expendable
  - 2. Recoverable
  - 3. Government Furnished Property (GFP)
- K. Federal stock number
- L. Location allocation
- M. Finding number
- N. Quantity supported
- O. Attaching hardware
- P. Unit of issue (i.e., pounds, feet, volumes, each, etc.)

### 8.4 FORMAT

The list shall be prepared in columnar format, one column for each of the major topics portrayed in the Contents paragraph of this DR. A page(s) shall be included at the beginning of the list which shall note the location of the elements of information and provide explanation of codes, indicators, abbreviations, etc. Electronic Data Processing techniques shall be utilized where applicable.

### 8.5 MAINTENANCE

The list shall be maintained by periodic revision and reissue. Revisions shall consist of an update by incorporation of information accumulated which provides accounting of added, deleted and change data relative to the list.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
 LYNN B. JOHNSON SPACE CENTER  
 DATA REQUIREMENT DESCRIPTION

CPL NUMBER

LINE ITEM NUMBER

LS-06

2. NUMBER

4. DATE

5. ORGANIZATION

6. REFERENCES

7. INTERRELATIONSHIP

1) WBS

2) All Plans

List, CEI Support Equipment

For use in performing logistics engineering analysis and for provisioning of support equipment.

(The Center Data Manager (Code JM2) will assign numbers in block 2.)

SECTION INFORMATION

8.1 SCOPE

This DR establishes the content, format, maintenance, and submittal requirements for the CEI Support Equipment List.

8.2 APPLICABLE DOCUMENTS

None.

8.3 CONTENT

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The list shall encompass the following:

- A. The list shall contain all support equipment, test equipment, special test equipment, general purpose tools and special tools required for servicing, testing, adjusting, aligning and maintaining the CEI.
- B. Information should include, but not necessarily be limited to, the following:
  1. Nomenclature
  2. Manufacturer's name and address or Federal Supply Code for manufacturer's (H4-1)
  3. Manufacturer's model/part number
  4. Federal Stock Number, if assigned
  5. Supported assembly and/or subassembly
  6. Physical, mechanical or electrical characteristics of item

8.4 FORMAT

The Contractor's internal format shall be used.

8.5 MAINTENANCE

The Plan shall be maintained in a current condition by page replacement or complete reissue to reflect the latest approved program changes.



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNN B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION	1. LINE ITEM NUMBER - LS-07
Support Requirements Analysis	2. NUMBER  4. DATE
A source of required information in determining logistics resources needed to support PEP maintenance and refurbishment activities in the U.S. during both the DDT&E and Operational phases of the program.	5. ORGANIZATION
	6. REFERENCES
	7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)	

#### 1. IDENTIFICATION INFORMATION

### 8.1 SCOPE

Engineering analyses shall be performed to systematically review systems, subsystems and equipments to identify the logistics support requirements.

### 8.2 APPLICABLE DOCUMENTS

None.

### 8.3 CONTENTS

Detailed engineering analyses are to be conducted during the DDT&E phase and are to include the following for each level of maintenance:

#### A. Subsystem Description and Status

Describe the functions of the subsystem.

#### B. Baseline Data

1. Subsystem Block Diagram and Utilization - Identifies all components and equipments down to the lowest level of repair.
2. Maintenance Concept - Summarize the maintenance concept under which the subsystem and its components are planned to be supported.
3. Maintenance Requirements - Describe preventive maintenance requirements for each component at a detail level. Provide failure rate data for each equipment/component identified on the block diagram. State the corrective maintenance requirements based upon failure modes and effects analyses, and other relevant data.

The maintenance requirements analysis is conducted on each repairable item to define the maintenance concept in terms of:

- o Maintenance tasks
- o Maintenance ground equipment
- o Facilities requirements
- o Manpower and skills
- o Spares and repair parts

### 8.3 CONTENTS (cont'd)

#### B. Baseline Data (cont'd)

- o Technical documentation
- o Consumables
- o The effects of environments
- o Turnaround requirements
- o Costs
- o Design characteristics
- o Frequency of maintenance tasks
- o Support equipment availability
- o Identification and description of tools, test equipment, facilities, personnel, spare/repair parts, and technical data
- o Qualification of maintenance support needs by time and place
- o Facilities loading to establish adequacy and optimum utilization
- o Transportation costs
- o Packaging costs
- o Pipeline spares requirements
- o Maintenance ground equipment investment
- o Repair labor and material
- o Facility investment

The output of the maintenance requirements analysis is used to develop:

- o Maintenance plans for each repairable item
- o Maintenance ground equipment identification
- o Spares provisioning requirements
- o Operations and maintenance documentation requirements
- o Logistics facility requirements
- o Logistics training requirements

Maintenance plans are used to ensure support of each repairable item, to consolidate similar requirements, to identify sources of repair, and to plan for acquisition and allocation of resources.

This section also requires a consolidation of repairables maintenance plans by system, subsystem, and separate equipment to identify sources of repair for similar families, major support equipment, spares and repair parts, facility and shop arrangements, manpower required, skills required, training required, and technical documentation required.

4. Manpower Summary - Estimate the number of manhours, by skill level, required to conduct each preventive and corrective maintenance task.
5. Other Logistic Resources
  - a. Technical Manuals - Identify technical manuals required for each subsystem, equipment and component.
  - b. Special Technical Data - Identify technical data required in addition to the technical manual to perform maintenance. Examples of such data include blueprints, test routines, diagnostic routines, and computer software.

### 8.3 CONTENTS (cont'd)

- c. Special Support and Test Equipment - Identify special support and test equipment. Support and test equipment shall be identified in two categories: (1) peculiar, which comprises tools and test equipment with application only to the Spacelab and required to maintain it, and (2) common, which comprises tools and test equipment normally required.
- d. Special Transportation or Storage Needs - Identify special requirements for transporting or storing logistic material.
- e. Special Support Requirements - Identify requirements for a special supplier or manufacturer to provide maintenance support of particular subsystems or equipment after PEP is delivered to NASA.

#### C. Support Requirements Analyses Records

Documentation of the maintenance concepts, maintenance requirements and tasks, and other logistic requirements at all levels of maintenance for PEP providing the information described in Paragraphs 1 and 2 above, are to be provided.

#### D. Support Equipment List (SEL)

Provide a support equipment list that includes all tools and test equipment required to perform specific operations necessary for servicing, testing, adjusting, aligning and maintaining the PEP. This list shall include Special Test Equipment (STE).

### 8.4 FORMAT

The Plan shall be in narrative format and shall be arranged by major topics.

### 8.5 MAINTENANCE

The Plan shall be maintained current and revised to reflect approved program changes.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNN B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION	1. NUMBER 2. LIST ITEM NUMBER LS-03
Forecast, Six-Month Material Requirements	3. NUMBER 4. DATE
To forecast liquids, gases and chemical requirements to be used in the program.	5. ORGANIZATION
	6. REFERENCES
	7. INTERRELATIONSHIP 1) WBS 2) All Plans

(The Center Data Manager (Code J82) will assign numbers in block 2.)

#### FUNCTION INFORMATION

Prepare six-month material requirements forecast covering PEP checkout requirements at O&C, OPF, VAB and Complex 39.

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ATTACHMENT NUMBER		EXHIBIT NUMBER		CONTRACT/RFI NUMBER		DRL NUMBER		PROJECT/SYSTEM		RESPONDENT	
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		ORL NUMBER - LINE ITEM NUMBER - MG-01
1. TITLE Plan, Manufacturing		2. NUMBER 4. DATE
3. USE To define manufacturing methods and requirements.		5. ORGANIZATION 6. REFERENCES 7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>Scope</u> This Data Requirement establishes the preparation and maintenance requirements for a Manufacturing Plan.		
8.2 <u>Applicable Documents</u> None required.		
8.3 <u>Content/Format</u> The Contractor may select any narrative format but as a minimum, shall address the following: <ul style="list-style-type: none"> <li>A. Manufacturing planning and control.</li> <li>B. Manufacturing processes and techniques, including items to be bought or procured.</li> <li>C. Manufacturing assembly sequence and parts flow plan.</li> <li>D. Safety during manufacturing operations.</li> <li>E. Tooling approach.</li> <li>F. Management and handling of parts and materials.</li> <li>G. Manufacturing facilities requirements and utilization.</li> <li>H. Facility and tool activation planning and control.</li> <li>I. Handling and storage of end items.</li> <li>J. Manufacturing test and post manufacturing checkout.</li> <li>K. Activation schedule.</li> </ul>		
8.4 <u>Maintenance</u> The document shall be kept current with program changes that effect manufacturing requirements.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER -  LINE ITEM NUMBER MG-02
1. TITLE  Plan, Contamination Control	2. NUMBER  4. DATE	5. ORGANIZATION  6. REFERENCES
3. USE To describe the Contractor's system for contamination control.	7. INTERRELATIONSHIP FED. STD No. 209 NASA SE-S.0073 MC999-096	
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION 8.1 <u>Scope and Content</u>  The plan will include as a minimum:  8.1.1 Control of manufacturing and assembly residues. 8.1.2 Controlled environments to be utilized such as, but not limited to, clean rooms. 8.1.3 Cleaning and cleanliness verification procedures. 8.1.4 Cleanliness preservation techniques including, but not limited to, packaging.  When clean rooms or clean work stations are to be utilized, they shall comply with Fed. Std. No. 209. Certain fluid system equipment, as specified in the NASA procurement package, require control of fluids used in the cleaning, test and checkout of the equipment. When so specified, this control shall be to NASA Specification SE-S-0073.  8.2 <u>Format</u>  Optional.		

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ATTACHMENT NUMBER		RESPONDENT			
EXHIBIT NUMBER		PREPARATION DATE:			
CONTRACT/REP NUMBER		PAGE 1 of 1			
DRL NUMBER		REVISION			
PROJECT/SYSTEM		PROJECT			
OSM/Power Extension Package (PEP) Project		TITLE			
3		4 O P R			
2 DRD NUMBER		5 TYPE			
1 LINE ITEM NO.		6 JSC DOCUMENT NUMBER			
9. REMARKS		7 FREQ. OF SUBM.			
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER - LINE ITEM NUMBER - OP-1
1. TITLE Plan, Ground Operations		2. NUMBER 4. DATE
3. USE To define PEP ground operations and requirements at the KSC and VAFB launch sites		5. ORGANIZATION 6. REFERENCES 7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		

8. PREPARATION INFORMATION

8.1 SCOPE

This DR establishes the preparation and maintenance requirements for the PEP Ground Operations Plan

8.2 APPLICABLE DOCUMENTS

None required.

8.3 CONTENT/FORMAT

The Contractor may select any narrative format; but as a minimum, shall address the following:

- A. Purpose and Scope
- B. Roles and Responsibilities
- C. Stand Alone Operations Description
- D. Integrated Operations Description
- E. Handling and Storage
- F. Ground Flows and Tinelines
- G. Facility Requirements and Utilization
- H. GSE Requirements and Utilization

8.4 MAINTENANCE

The document shall be kept current with program changes that effect launch site ground operations.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER -  LINE ITEM NUMBER - <b>OP-2</b>
1. TITLE  Plan, Flight Operations Support		2. NUMBER  4. DATE
3. USE  To define the procedures to be utilized for support of PEP Flight Operations		5. ORGANIZATION  6. REFERENCES  7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u>  This DR establishes the plans, training, requirements, procedures, operations, and data to be used for pre-flight, launch, on-orbit, recovery, and post-flight PEP operations.		
8.2 <u>CONTENT</u>  A. Define the plan for the PEP qualification flight. B. Develop training objectives and their corresponding test items. C. Define launch operations procedures. D. Define activities to be conducted in each phase of orbital operations, including flight planning, PEP deployment, orientation, maneuvering, monitoring, storage, and related items. E. Determine the instrumentation/monitoring requirements. F. Develop contingency operations plans, including EVA. G. Determine the engineering, observational, and operational data required for post-flight analysis.		
8.3 <u>FORMAT</u>  Narrative in a format consistent with the Contractor's internal procedures.		

ATTACHMENT NUMBER		RESPONDENT									
EXHIBIT NUMBER		PREPARATION DATE:									
CONTRACT/HFP NUMBER		PAGE 1 of 2									
DRL NUMBER		REVISION:									
PROJECT/SYSTEM		OSM/Power Extension Package (PEP) Project									
TITLE		TELEPHONE NUMBER 713 483-6391.									
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LINE	ORD	NO.	NO.	TYPE	JSC	PREP.	INITIAL	OF	SUBMITTAL	COPIES	DATE
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9. REMARKS											
1 RA-01 Plan, Product Assurance											
First submittal due with proposal. Update 75 days after ATP. Final due 120 days after ATP.											
2 RA-02 Reports, Safety Analysis											
30 days prior to PDR, CDR and delivery											
3 RA-03 Reports, Accident/Incident											
4 RA-04 Analysis, Failure Modes and Effects (FMEA)											

JSC DATA REQUIREMENTS LIST (ORL) (CONTINUATION SHEET)				ORL NUMBER	REVISION	PAGE
5	2	RA-5	3	Test, Critical/Limited Life Items	2	2 of 2
20 days prior to PDR - Preliminary Final with CDR package						
6	2	RA-06	3	Plan, Certification (Qualification) Test	1	RT
60 days prior to test						
7	2	RA-07	3	Reports, Problem and Resolution	2	AR
Telecon report - due within 24 hours of detection or occurrence Documented report - due within 5 days of detection or occurrence Resolution report - due within 21 days of telecon report						
8	2	PA-08	3	Acceptance Test Spec. and Procedure	2	7
1	2		3		5	6
1	2		3		5	6
1	2		3		5	6

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER - LINE ITEM NUMBER - <b>RA-01</b>
1. TITLE <b>Plan, Product Assurance</b>		2. NUMBER 4. DATE
3. USE To provide a document which defines the planned implementation of the contractual requirements for Quality, Reliability and Safety		5. ORGANIZATION 6. REFERENCES 7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u> This DR establishes the requirements for the preparation of a Product Assurance Plan covering the contractor's policies and objectives for organization, implementation, and control of the quality, reliability, and safety programs from the initial phase throughout the development, fabrication, and delivery of the PEP System.		
8.2 <u>CONTENT</u> The plan shall be prepared as follows: A. <u>Product Assurance</u> The initial submittal of the plan shall include, as a minimum the following: 1) A process and inspection flow chart. 2) Proposed revisions or additions to quality operations in use by the contractor at his plant to satisfy contractual quality requirements. 3) Time schedule for submittal of quality program documents in accordance with contractual requirements. 4) Contractor's organizational structure identifying all elements which will perform functions, satisfying all required quality program functions including relationships between line, service, staff, organizations and their responsibilities and functions for both policies and actions. 5) The final detailed plan shall represent the control program outlines in the following format including the proposed methods of implementation: Management and planning. Design and Development. Identification and data retrieval.		

## 8.2 CONTENT (Continued)

Procurement.  
Fabrication controls.  
Testing, inspection, and evaluations.  
Nonconforming articles and materials.  
Metrology.  
Stamp control.  
Handling, storage, preservation, marketing, labeling,  
packaging, packing, and shipping.  
Sampling plans, statistical planning and analysis.  
Government property control.  
Flight test/ground operations.

The plan(s) shall provide the identity of all elements of program function including organizational pattern (i.e., relationship to line and staff), implementation policy and procedures, the sub-contract control system, and the reporting and control system for functions outlined in the plan.

The outlines program shall insure, through proper planning and control, that quality requirements of the contract agreement shall be determined and satisfied throughout all phases of contract performance including modification and checkout functions.

### B. Reliability

As a minimum, this section shall include the following:

- 1) A description of the reliability techniques, and methodologies to be employed in the development of a highly reliable PEP System design.
- 2) Verification methodology that the design exhibits the desired reliability features.
- 3) Assurances that maintenance of the design reliability will continue through the production phase.
- 4) Description of tasks to be accomplished, identification of their products and scheduling their progression.

## 8.2 CONTENT (Continued)

### C. Safety

This section should identify and describe the safety tasks to be accomplished, their products, scheduling, and techniques to be employed. Specifically, the plan should describe:

- 1) The methods to be employed to assure the identification, elimination, and/or control of potential hazards which may lead to injury, loss of personnel, and/or damage or loss of flight, or mission related ground support equipment throughout the complete cycle of the program.
- 2) The relationship of all safety activities, and the coordination between System Safety, Industrial Safety, Test Operations Safety, and Field Site Safety.
- 3) The safety organization responsible for safety implementation, defining responsibilities, authority, interfaces and relationships with other PEP program organizations.
- 4) The execution of system safety analyses, including development of guidelines, constraints and requirements, as well as the hazard analyses activities to be performed.

## 8.3 FORMAT

Optional

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		ORL NUMBER -  
1. TITLE  Reports, Safety Analysis		LINE ITEM NUMBER - <b>RA-02</b>
3. USE  To verify that safety is a design feature		2. NUMBER  
		4. DATE  
		5. ORGANIZATION  
		6. REFERENCES JSC 13810 Section 5
		7. INTERRELATIONSHIP  
(The Center Data Manager (Code JM2) will assign numbers in block 3.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u>  The submittal of safety analysis reports containing information compatible with the objectives for Phases I, II, and III, as described in Section 5.0 of JSC 13810, are recommended.		
8.2 <u>CONTENT</u>  As a minimum, each report should contain:		
A. Applicable system safety guidelines, constraints, and requirements.		
B. Results of safety studies and safety inputs developed to support trade studies.		
C. Results of the hazard analyses, including the complete identification of hazards, their causes, their effect on personnel, equipment, and mission and the results of using the Hazard Reduction Precedence Sequence (Reference JSC 13810) to eliminate or control hazards.		
D. A summary of residual hazards (catastrophic or critical), and supporting risk assessments, including rationale for retention.		
8.3 <u>FORMAT</u>  Optional		



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNN B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER - LINE ITEM NUMBER - <b>RA-03</b>
1. TITLE Report, Accident/Incident		2. NUMBER 4. DATE
3. USE To present the cause and analysis of each accident/ incident		5. ORGANIZATION 6. REFERENCES <b>NH135300.4(1D-1)</b> 7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1	<u>SCOPE</u> This DR establishes the requirement for preparation of the PEP Accident/ Incident Report.	
8.2	<u>APPLICABLE DOCUMENTS</u> NHB 1700.1(VI) NASA Safety Manual	
8.3	<u>CONTENT</u> Accidents, injuries, occupational illnesses and fires shall be reported to the contracting officer in accordance with the NASA Safety Manual.	
8.4	<u>FORMAT</u> The report shall be presented on NASA Forms 244, 345 and JSC Form _____ as applicable, to the reporting event. Immediate Accident/Incident Notifications shall be in the format of TWX, as they occur.	
8.5	<u>MAINTENANCE</u> N/A	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER -  
1. TITLE  Analysis, Failure Mode and Effects Analysis (FMEA)		LINE ITEM NUMBER - RA-04
3. USE  For detailed qualitative evaluation of design safety and reliability		2. NUMBER  
		4. DATE  
		5. ORGANIZATION  
		6. REFERENCES  
		7. INTERRELATIONSHIP  
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
0. PREPARATION INFORMATION		
8.1 <u>SCOPE</u>  The FMEA should be performed in a top down system analysis technique, proceeding to the lowest level practical at the time of the analysis performance. For items designated as mission critical, the FMEA should eventually progress to one assembly level within the line replaceable unit (LRU).		
8.2 <u>CONTENT</u>  As a minimum, the FMEA documentation should provide the following for each item analyzed.		
A. Identification by FMEA assigned identifier, drawing reference designation, and item nomenclature.		
B. Function performed.		
C. Failure modes and possible causes.		
D. Effect of failure on the applicable component, subsystem, PEP system, and Orbiter.		
E. Description of controls in effect to preclude the failure or to minimize risk of its occurrence, or to reduce the failure effects to negligible impact (these include design redundancy, operating procedures, testing results, etc.).		
F. Techniques by which failure can be detected and isolated.		
G. Corrective actions or other options available to the flight crew.		
H. Criticality category (as defined in Safety/Reliability Program Plans).		
8.3 <u>FORMAT</u>  Optional		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER -  LINE ITEM NUMBER - <b>RA-05</b>
1. TITLE  List, Critical/Limited Life Items	2. NUMBER  4. DATE	5. ORGANIZATION  6. REFERENCES  7. INTERRELATIONSHIP
3. USE  To identify critical/limited life items and to assure special handling and tracking		
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u>  Critical items are those so designated by the FMEA because of their function or use in the design and, are those items which have been determined to exhibit life less than the specified system life. The items should be identified to enable the assurance of special handling and tracking.		
8.2 <u>CONTENT</u>  This identification will be provided by a critical/limited life-items list developed in two parts. Part one shall identify the critical items and provide the following data: <ul style="list-style-type: none"> <li>A. Item by name, part number and FMEA reference(s).</li> <li>B. Quantity used in the design.</li> <li>C. Criticality designation from the FMEA.</li> <li>D. Critical failure mode(s).</li> <li>E. Rationale for retention in the design.</li> </ul> Part two of the list would identify the limited life items and provide the following data. <ul style="list-style-type: none"> <li>A. Item identification by name and part number.</li> <li>B. Criteria for selection.</li> <li>C. Special actions required, such as inspection, maintenance, etc.</li> <li>D. Age limits.</li> <li>E. Documentation requirements to verify controls.</li> </ul>		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER -  
		LINE ITEM NUMBER - <b>RA-06</b>
1. TITLE  <b>Plan, Certification (Qualification) Test</b>		2. NUMBER  
		4. DATE  
3. USE  <b>To provide JSC with the plan and procedure to certify PEP</b>		5. ORGANIZATION  
		6. REFERENCES  
		7. INTERRELATIONSHIP  

*(The Center Data Manager (Code JM2) will assign numbers in block 2.)*

**8. PREPARATION INFORMATION**

**8.1     SCOPE**

The plan will define the methods to be employed in the verification that the PEP meets its technical requirements. It also should define the certification parameters and conditions pertinent to the test progress and the PEP system performance.

**8.2     CONTENT**

Specific tests and analyses should be identified with the certification features to which they are applicable. Also, recovery plans for any experienced test anomalies should be delineated. Specifically, the test plan should provide:

- A. Part name and number of the article being certified.
- B. Serial and part numbers or drawing number of specimens to be tested.
- C. Environments and life/cycle requirement.
- D. Certification method (test, analysis, etc.) including sequence (with the supporting rationale when analysis is performed in lieu of test).
- E. Environmental acceptance test requirements.
- F. Statement of requirement for functional test prior to and following qualification test (and list appropriate references.)
- G. Number of specimens and allocation to test.
- H. Type of tests to be conducted.
- I. Objective of the test.
- J. Test duration.
- K. Environmental and performance test condition (including pass-fail criteria and tolerance).
- L. Operational mode of the equipment during test (on or off).

- M. Retest criteria.
- N. Allowable maintenance during test.
- O. Disposition of test specimen(s).
- P. Manner of analysis and utilization of test results.
- Q. Definition of failure.
- R. Qualification test readiness review and qualification site approval.

8.2.1 The certification test procedure should provide detailed documentation of all testing to demonstrate the test item conforms to all applicable specified requirements. Contained within the procedure should also be a listing of tests, test sequences, test conditions to be established, instrumentation requirements, the detailed procedures to be followed during the test, data recording requirements, the required values and tolerances, and the data recording sheets to be used. In addition, a cross-reference to the applicable specified requirements governing the testing should be provided. To assure test performance adequacy, the test procedure should also:

- A. Assure the attainment of repeatable conditions.
- B. Establish and determine significant failure modes.
- C. Determine the effects of varied stress levels and performance parameters.
- D. Determine the effects of tolerance combinations and parameter drifting

### 8.3 FORMAT

Optional

### 8.4 MAINTENANCE

One time submittal with change page revisions as necessary.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER -  LINE ITEM NUMBER - RA-07
1. TITLE REPORT, PROBLEM AND RESOLUTION		2. NUMBER  4. DATE
3. USE To provide visibility on hardware problems.		5. ORGANIZATION  6. REFERENCES  7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u>  This DR establishes the requirements for content, format, maintenance and submittal of problem and resolution reports.		
8.2 <u>CONTENT</u>  Nonconformance reporting to JSC will, as a minimum, include the following:		
8.2.1 All problems beginning with end item acceptance inspection shall be reported to JSC. Problems that occur prior to acceptance inspection that will, or have the potential to, adversely affect safety, contribute to the delay of a scheduled event, result in a significant design change shall be reported. Updated reports depicting subsequent analysis and corrective action shall be provided until final resolution can be made.		
The Problem Report shall include the following information:		
(1) Subsystem Name (2) Part Name and Number (3) Nonconformance Report Number (4) Date of Nonconformance Occurrence (5) Description of the Nonconformance		
The Resolution Report shall include the following:		
(1) (1) through (5) inclusive of the Problem Report (6) Description and Status (open or closed) of Corrective Action (7) Organization Responsible for Corrective Action		
8.2.2 The Problem Summary Report shall include the following:		
(1) Tabulation of problems (2) Status as to proposed corrective action and anticipated closure data (3) All information shall be reported by end item unit Number		

8.3 FORMAT

The contractor's format shall be used.

8.4 MAINTENANCE

Updated reports required continually as closeout/explanations occur.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER - LINE ITEM NUMBER - <b>RA-08</b>
1. TITLE  Acceptance Test Specification and Procedure		2. NUMBER  4. DATE
3. USE  To define the total acceptance test activity which will verify the PEP hardware meets its performance and design requirements.		5. ORGANIZATION  6. REFERENCES  7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE/CONTENT</u>		
8.1.1 The acceptance test specification should provide the following:		
A. Definition of the philosophy of acceptance testing, the ground rules for testing, the requirements for analysis, the program control required, and the specific acceptance test environment exposure conditions to be applied during the tests. The acceptance test specification should also define those tests to be conducted to determine that a component is capable of meeting performance requirements prescribed in purchase requests or other documents identifying adequate performance capability for the item in question.		
B. Recommendation of the number of test specimens to be tested and designation of which are representative of each component or subsystem for which a certification test requirement has been written. The recommended number of acceptance test specimens should reflect the results of any previous acceptance testing of similar hardware.		
C. Test objective, acceptance and rejection criteria, environmental limits, references to applicable safety standards for hazardous operations, and allowable types of adjustments for data recording. Retest criteria, test reporting requirements, and the disposition of tested articles should also be specified.		
8.1.2 The acceptance test procedure should outline the test program concepts, and describe the methods for implementing the test requirements. It also should include the detailed description of the Contractor's testing and checkout of the PEP system prior to shipment. Specifically, the following information should be provided by the acceptance test procedure:		
A. Test program mission objectives and related test philosophy, including various test relationships.		
B. Measuring and test equipment to be used specifying range, accuracy, and type.		



8.1.2 Continued

- C. Support equipment requirements and configuration, including part number, serial number, nomenclature, drawing number, etc.
- D. Related support equipment configuration.
- E. Identification of all applicable detailed operating procedures, process specifications, program description documents, test and inspection procedures, etc., including document number, revision, and title, and operational checks or preliminary calibration of test setup.
- F. Exact method of inspecting or measuring, including necessary manipulation of controls of the article involved and on the measuring and test equipment.
- G. Conditions that must be maintained during inspection and test, including ambient or environmental conditions, and precautions to be observed to prevent damage to the articles or instruments involved.
- H. Criteria for passing or failing test, or for determining conformance or rejection of the article, including reference to workmanship inspection standards.
- I. Details for sampling plans to be used, if applicable.

8.2 FORMAT

Optional

PRECEDING PAGE BLANK NOT FILMED

ATTACHMENT NUMBER		RESPONDENT									
EXHIBIT NUMBER		PREPARATION DATE:									
CONTRACT/RFP NUMBER		PAGE 1 of 3									
GRI NUMBER		REVISION									
PROJECT/SYSTEM		OSM/Power Extension Package (PEP) Project									
TITLE		NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENTS LIST (ORL) (The Center Data Manager (Code 1M2) will assign numbers in blocks d, 5, and 6.) TELEPHONE NUMBER 713-483-6391.									
1	2	3	4	5	6	7	8	9	10	11	12
LINE ITEM NO.	ORD NUMBER	TITLE	O P R	TYPE	JSC DOCUMENT NUMBER	7 REQ. OF SUBM.	INITIAL SUBMITTAL	10 25 OF DATE	11 COPIES	A TYPE B NO.	
1	SE-01	Drawings and Associated Lists	-	3	-	RT	See 9				
8. Preliminary design drawings and hardware/software product drawings including schematic diagrams and wiring (connection) diagram drawings											
2	SE-02	Data Package Acceptance	-	2	-	RT	See 9				
One set with hardware											
3	SE-03	Contractor Design Reviews, Config. Insp., Product Audit	-	2	-	N/A	See 9				
30 days after contract and by first of each month until last hardware delivery											
4	SE-04	Report Mass Properties	-	2	-	RT	See 9				

JSC DATA REQUIREMENTS LIST (DRL) (CONTINUATION SHEET)			DRL NUMBER	REVISION	PAGE 2 of 3
5	SE-05	Plan Material Control	4	2	RT See 9
6	SE-06	Plan, Design, Development and Test	4	1	RT See 9
8. Initial submittal due with proposal. Update 75 days after ATP. Final due 120 days after ATP.					
7	SE-07	Plan, Electromagnetic Interference	4	1	RT See 9
First submittal due 75 days after ATP. Final submittal due 120 days after ATP.					
8	SE-08	Test Requirement, Qual. Test	4	2	AR See 9
Will utilize internal documentation only to meet this requirement					
9	SE-09	Requirement - Acceptance Test	4	2	T See 9
Will utilize internal documentation only to meet this requirement includes component and system level testing					



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		URL NUMBER -  
		LINE ITEM NUMBER - <b>SE-01</b>
1. TITLE  <b>Engineering Design Drawings and Associated Lists</b>		2. NUMBER  
		4. DATE  
3. USE  To provide an End Item configuration record and a means for re-procurement of previously built items. Used for design, manufacture, test, installation, maintenance and logistic support.		5. ORGANIZATION  
		6. REFERENCES  
		7. INTERRELATIONSHIP  
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION <b>8.1 Scope</b>  This DR establishes the content, format, maintenance, and submittal requirements for Engineering Design Drawings and Associated Lists procured under the contract.		
<b>8.2 Applicable Documents</b>  MIL-D-1000A MIL-STD-100 NHB-1440.4A		
<b>8.3 Content/Format</b>  Engineering Design Drawings and Associated List. (hereinafter referred to as drawings) shall meet the requirements of level of MIL-D-1000A and the following supplementary requirements.		
A. Drawings shall be identified by the Contractor code identification and drawing numbers in accordance with MIL-STD-100.		
B. Drawings shall be of sufficient clarity so that when reproduced, the reproduction shall meet the legibility requirements of MIL-STD-100; or when microfilmed in accordance with NHB 1440.4A, blow backs of Type 1, Class 3 microfilm will produce copies conforming to the legibility requirements of NHB 1440.4A.		
<b>8.4 Maintenance</b>  Changes and/or updating of drawings shall be accomplished in accordance with the Contractor's configuration management system.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DR. NUMBER - SE-02
1. TITLE Package - Acceptance Data		2. NUMBER 4. DATE
3. USE To provide significant documentation of hardware and historical events.		5. ORGANIZATION 6. REFERENCES JSC 07700 Volume IV 7. INTERRELATIONSHIP SE-01

(The Center Data Manager (Code JM2) will assign numbers in block 2.)

#### 8. PREPARATION INFORMATION

##### 8.1 Scope

An Acceptance Data Package (ADP) shall be provided for each end item or lot shipment of end items at time of acceptance and delivery.

##### 8.2 Content

8.2.1 Documentation required for the preparation of the acceptance data package shall be compiled from engineering released drawings, test records and specifications, as well as quality assurance verified fabrication and inspection records.

8.2.2 The acceptance data package shall consist of each element of data specified herein, which is also specified in the DRL section of the contract.

8.2.3 Each ADP shall be a condition of acceptance for each end item.

##### 8.2.4 Format Requirements

The format requirements are either Mandatory or Guideline. A Mandatory format indicates that the Contractor shall use a format identical to the one specified in this document for a given ADP element of data. A Guideline format requires the Contractor provide the data element in a format similar to the one depicted in this document.

##### 8.2.4.1 General Format Provisions

- A. Dimensions - A uniform document size of 8 1/2" x 11", or 11" x run, shall be utilized (Drawings excepted)
- B. Quality - All documentation legibility and contrast shall be such that when subjected to microfilming, it will produce a legible copy.
- C. Identification - Each page of the ADP shall be identified with the following, in addition to the report title:

#### 8.2.4.1 General Format Provisions (cont'd)

1. Report Number
2. Page Number
3. Part Name
4. Part Number
5. Serial Number

#### 8.2.4.2 ADP Data Elements

The ADP Data Elements are as follows:

- A. Title Page
- B. Table of Contents
- C. Acceptance Calibration Data
- D. DD Form 250
- E. Shipping Documents
- F. Weight Record
- G. Waiver Record
- H. Acceptance Test Data
- I. Notes and Comments

Other data elements to be included when required are:

- J. As-Built Configuration Record
- K. Material Identification and Usage List

#### 8.2.4.3 ADP Data Element Description and Format Requirements

##### A. TITLE PAGE

FORMAT TYPE: GUIDELINE

A title page shall be provided for each ADP. The title page will depict: Part Name, Part Number, Serial Number, and Approval Signature blocks for Contractor's Quality Control, and NASA Representative.

### 8.2.4.3 ADP Data Element Description and Format Requirements (cont'd)

#### B. TABLE OF CONTENTS

FORMAT TYPE: Contractor

A Table of Contents shall be provided for each ADP. The Table of Contents provides an inventory of the ADP contents.

#### C. ACCEPTANCE TEST CALIBRATION DATA

FORMAT TYPE: Contractor

This element of the ADP includes numerical results of all specific functional tests of instrumentation equipment performance and calibrations. Calibration curves for analog measurement systems shall be plotted using a nominal minimum of eleven discrete points uniformly spaced over the rated range of the equipment (in accordance with Figure 3). Calibration curves for measurements having digital or "staircase" outputs shall contain as many steps as specified in the equipment design specifications.

#### D. DD FORM 250

FORMAT TYPE: Mandatory

A DD Form 250 shall be included in each ADP.

#### E. SHIPPING DOCUMENT

FORMAT TYPE: Contractor's Format

A shipping document containing evidence of inspection acceptance, shall be prepared and included in the Acceptance Data Package for each item delivered. The shipping document shall include, when applicable, the following information:

- A. Packing Lists (itemizing contents)
- B. Certificates of Conformance (materials, cleaning, etc.)
- C. Preservation Information including:
  - 1. Specification - Preservation requirements
  - 2. Date preservation was accomplished
  - 3. The schedule dates for preservation measures
  - 4. Any additional information concerning preservation measures that may be necessary during subsequent handling, shipping or interim storage.
- D. Special Handling Procedures
- E. Storage Procedures



8.2.4.3 ADP Data Element Description and Format Requirements (cont'd)

F. WEIGHT RECORD

FORMAT TYPE: Guideline

The Contractor shall provide a record of the actual weight for each end item.

G. WAIVER RECORD

FORMAT TYPE: Mandatory

The Contractor shall provide a record of approved major Waivers. The record shall contain a listing of such Waivers authorized at the time of delivery of the End Item. Copies of all Waivers listed in the record shall be included in the ADP.

H. ACCEPTANCE TEST DATA

FORMAT TYPE: Contractor's Format

The Contractor shall provide acceptance test data sheets reflecting final acceptance test results recorded per the applicable test specification. The acceptance data sheets shall reflect quality control verification of all test results recorded.

I. NOTES AND COMMENTS

FORMAT TYPE: Mandatory

Notes and Comments - When other sections do not normally provide for such reporting, the Contractor shall prepare notes and comments annotating events or requirements. Anomalous conditions encountered during acceptance testing, special instructions, advice or warning for personnel safety shall be included.

J. SYSTEM AND COMPONENT HISTORICAL RECORD

FORMAT TYPE: Mandatory

The Contractor shall maintain System and Component Historical Records on NASA/MS Form 772 (Rev. July, 1967 or later). The form shall be maintained in accordance with JSC Quality Operating Procedure Number 4.3.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER - LINE ITEM NUMBER - <b>SE-03</b>
1. TITLE Design Review, Configuration Inspection, Project Audit Agendas, Packages, and Minutes		2. NUMBER 4. DATE
3. USE To provide necessary data to conduct design reviews, configuration inspection, and product configuration audit on end items and associated ground support equipment, as applicable, and to document those actions taken.		5. ORGANIZATION 6. REFERENCES 7. INTERRELATIONSHIP TM-04, TM-03, SE-02, SE-03
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u> <p>The following elements of data shall be provided to NASA; review agendas, introductory report, review data package, minutes, final review report, and status report.</p>		
8.1.1 <u>AGENDA</u> <p>Shall be provided prior to each Design Review, or Configuration Inspection in sufficient time to allow for coordination with NASA and to obtain concurrence. It should include listing of the data for review using Enclosure (1) for this purpose.</p>		
8.1.2 <u>INTRODUCTORY REPORT</u> <p>Shall be provided as a handout that documents the introduction of the review and includes report contents, purpose of review, agenda, review participants review and evaluation procedures, list of documentation for review, and a system description. Contents of handout shall be briefed at the general assembly kickoff meeting.</p>		
8.1.3 <u>REVIEW DATA</u> <p>Shall contain information from which NASA can obtain an indepth, detailed technical review of all work being performed to the date of the applicable product review. Information concerning status of progress versus plan should also be included in the data pack. The Contractor will provide rationale for alternate design/manufacturing plans adopted or recommended to NASA. See Attachment A for typical review items.</p>		
8.1.4 <u>REVIEW ITEM DISPOSITION FORMS</u> <p>Shall be prepared per Enclosure (2) to document action items, either NASA or Contractor's resulting during the review process.</p> <p><u>NOTE:</u> Any attempt to change the baselined requirements as specified in the CI specification will not be accepted. RID's shall not initiate Engineering Change Proposal (ECP) activity.</p>		

#### 8.1.5 REVIEW TEAM MINUTES

Shall contain information that the NASA/Contractor teams feel will enhance closing of open actions or RID's or provide better design definition. Format for the team minutes is presented in Enclosure (3). A summary of all the RID's written with a description of action taken; i.e., open/closed/withdrawn, etc., during the review shall be included in the team minutes. Format for the RID summary shall be prepared per Enclosure (4), that lists all data presented to NASA for review/approval and its disposition. The minutes shall include Product Approval Form per Enclosure (5), and shall be co-signed by both the NASA/Contractor Team captains. These minutes shall become part of the Design Review Final Report.

#### 8.1.6 FINAL REVIEW REPORT

The Contractor is responsible for compiling, publication, and distribution of the review report. Contents of the report shall consist of the Design Review Board minutes prepared by the NASA and a series of enclosures to the minutes. Contents of the enclosures are as follows:

Enclosure A - Description of purpose and product of review listing of team members, RID summary, and the board briefing.

Enclosure B - The RID's

Enclosure C - The team minutes and the product approval forms

#### 8.1.7 STATUS REPORT

A status of the action and closeout of RID's will be made to NASA by the Contractor. The RID's summary form (Enclosure 4) should be used for this reporting.

#### 8.1.8 RID CLOSEOUT

Closeout of open RID's shall be prepared per Enclosure (6), signed by Contractor and transmitted to NASA for signature approval. Upon return of the signed Product approval form (Enclosure 5) by NASA to the Contractor, the Contractor RID action is deemed closed.

#### 8.1.9 CONTRACTOR CONFIGURATION INSPECTION

Will be accomplished on the first qualified or qualifiable production end item following Contractor's Qualification Testing Program and prior to acceptance and delivery of the Contract End Items. This is basically accomplished by a comparison of the "as-built" configuration to the "as-designed" requirement and identifying and resolution any differences. See Attachment (A) for typical configuration inspection review items.

#### 8.1.10 FORMAT

See Enclosures 1 through 6.

#### 8.1.11 MAINTENANCE

Review packages shall be updated and submitted in final form to reflect closure of action items in accordance with the review minutes.

Attachment A  
Preliminary Design Review (PDR)

Typically, the items for review at the PDR should include the following:

- A. Preliminary ICD's
- B. Design analyses
- C. Layout, general arrangement, and envelope drawings (DRD SE-01)
- D. Schematics and block diagrams
- E. Sizing, trade study, and design study results
- F. Material and process specification listings
- G. Applicable procurement specifications
- H. Test requirements (DRD SE-08, 09)
- I. Mockup and models
- J. Updated plans, and procedures
- K. Commonality candidates; identification, rationale, and status
- L. Proposed additions to the NASA baseline

Critical Design Review (CDR)

Typically, the items for review at the CDR should include the following:

- A. ICD's
- B. Detailed design drawings (DRD SE-01)
- C. Design analyses and reports
- D. Test data (DRD SE-08, 09)
- E. Procurement specifications
- F. Mockups and models
- G. Prototypes, breadboards, models
- H. Material and process specifications
- I. Commonality hardware status reports
- J. Program procedures
- K. Proposed additions to the NASA baseline
- L. Selected documentation (FMEA's, hazard analyses, etc.) (DRD RA-04)

Attachment A (cont'd)

Configuration Inspection (CI)

Typically, the items for review at the CI should include the following:

- A. Acceptance Data Package (DRD SE-02)
- B. As-built configuration record (DRD CM-02)
- C. End-Item product specification (Part II) (DRD CM-09)
- D. Drawing and associated lists (DRD SE-01)
- E. Material and process specifications
- F. Qualification Test Report (when applicable) (DRD SE-08)
- G. Acceptance test data (DRD SE-09)

Enclosure 1

Enclosure 2

Enclosure 3

Enclosure 4

Enclosure 5

Enclosure 6

NASA-JSC

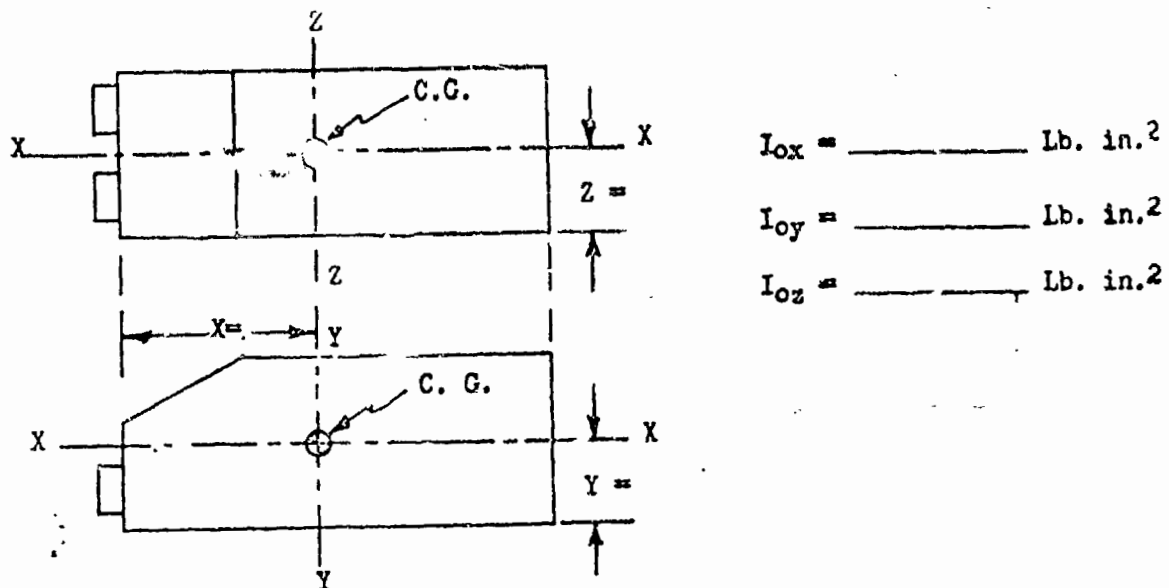
(Forms)

- (1) Data for Review
- (2) Review Item Disposition (RID)
- (3) Team Minutes
- (4) RID Summary
- (5) Product Approval
- (6) RID Closeout

(to be added by JSC as applicable)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER -  LINE ITEM NUMBER - SE-04
1. TITLE  Report, Mass Property Status		2. NUMBER  4. DATE
3. USE  To document end item mass properties		5. ORGANIZATION  6. REFERENCES  7. INTER RELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 The following specific elements of information shall be included in the Monthly Mass Property Status Report:		
8.1.1 The Monthly Weight Status shall be submitted in conformance with the format of Figure 1. The detail breakdown shall be in the Contractor's detailed weight statement format. In reference to Figure 1, the No. Req. shall be current per system or end item. The previous and current specification weight shall be the weight approved by NASA, representing a maximum weight that shall not be exceeded. This weight shall be compatible with the specification requirements.		
<p>The current weight shall be the weight status at the particular reporting period and shall be shown to the nearest tenth pound. The previous weight shall be the current weight of the previous reporting period. The current weight basis is the percentage of the weight which is estimated, calculated or actual at the particular reporting period. Figure 1 shows an example of two consecutive months reporting to illustrate the shifting of weight from current to previous on subsequent reports.</p>		
8.1.2 The current and specification weight change justification shall be submitted in conformance with the format shown in Figure 2. This figure shows two consecutive month reportings to illustrate the shift of weight from current to previous for subsequent reports. It should be noted that when specification weight is changed that a reference to the NASA direct is required.		
8.1.3 The Mass Property data shall be submitted as indicated below, or as mutually agreed by NASA and the Contractor. (Note: These data may be calculated and need only be supplied, on reports subsequent to the first report, when the weight or dimensional configuration has changed sufficiently to affect the center of gravity or the weight moments of inertia.)		
<p>Center of gravity - The center of gravity of all components shall be presented in the form of a sketch showing the locations to the nearest tenth inch, from three mutually perpendicular identifiable planes as illustrated in the example. Actual weights shall be accompanied by a list of corrections to the "as weighed" condition to correct the weight to the configuration defined in the Procurement Specification.</p>		

8.1.3 (cont'd)



EXAMPLE C. G. AND INERTIA SKETCH

Weight Moment of Inertia - The weight moment of inertia ( $I_0$ ) of all components shall be given to the nearest "pound-inch squared" about three mutually perpendicular axes through the center of gravity as illustrated in the example.

- 8.1.4 The current potential weight increases or decreases shall be submitted as part of this monthly Mass Property Status Report and particularly proposed weight decreases whether in-scope or not. Action being taken in implementing these weight changes should be noted.

Along with the above reporting requirements, the Contractor shall also provide the following information as mutually agreed to by NASA and Contractor.

- A. Submit a form containing allocated weights for the component at the level of detail specified in the Detail Weight Statement in Appendix B of MSC-04419, or MIL-M-38310 3rd generation, or MIL-STD-1374 Part II, 90 days after contract award. Submit revisions as required by re-allocation and changes to the allocated weight and status weight with each report.
- B. Submit a form for released drawings weekly starting with the release of drawings to Manufacturing and continuing until 100% release. Monthly update including revisions required by the release of new or changed drawings is required subsequent to 100% release and are to be included with each status report.



8.1.4 (cont'd)

- C. Results of actual weights shall be included in the monthly revisions to the form data.
- D. Data in the format of the form may be transmitted with each Mass Properties Status Report in the form of punched cards or magnetic tape, compatible with IBM 370-165 or 370-155 computer, in lieu of the form.
- E. Data transmittal methods to be the subject of negotiation.

8.1.5 After the initial Mass Property Report submittal, a weight change of 1.0 pounds or 1.0%, whichever is greater, will not require a formal report; the current weight status need only be included in a Monthly Progress Report. A formal Mass Property Status Report will be submitted at least every quarter defining all accumulated changes since the previous formal Mass Properties Status Report.

8.1.6 End item(s) shall be weighed and the center of gravity verified prior to delivery. These data shall be supplied in the Acceptance Data Package, and the last scheduled Mass Property Status Report prior to delivery.

(a)

ITEM & P/N	NO. REQ.	PREVIOUS SPEC. WEIGHT DATE	SPEC WT.	CURRENT SPEC. WEIGHT DATE	PREVIOUS WEIGHT DATE	WEIGHT CHANGE FROM PREVIOUS	CURRENT WEIGHT DATE	CURRENT WEIGHT BASIS-% E C A
TOTAL		300	+4.3	304.3	301.0	+2.3	303.3	10 50 40

(b)

ITEM & P/N	NO. REQ.	PREVIOUS SPEC. WEIGHT DATE	SPEC WT.	CURRENT SPEC. WEIGHT DATE	PREVIOUS WEIGHT DATE	WEIGHT CHANGE FROM PREVIOUS	CURRENT WEIGHT DATE	CURRENT WEIGHT BASIS-% E C A
TOTAL		304.3	-1.0	303.3	303.3	+2.0	305.3	10 49 41

Figure 1. Weight Status Reporting Format - Example, Consecutive Month Reporting

SE-04

(a)			
PREVIOUS STATUS (DATE _____)	DIRECTIVE	SPEC. WT. CHANGE	CURRENT WEIGHT & STATUS
Change			
(1)	Spec MC-XXX-000X (In-Scope Change)		
(2)	Spec MC-XXX-000X Amendment B		
CURRENT STATUS (Date _____)			
(b)			
PREVIOUS STATUS (DATE _____)	DIRECTIVE	SPEC. WT. CHANGE	CURRENT WEIGHT & STATUS
Change			
(1)	Am. B. Spec MC-XXX-000X		
(2)	Amendment C (In-Scope Change)		
CURRENT STATUS (DATE 1-2-73)			

Figure 2. Current and Specification Weight Change Justification - Example, Consecutive Month Reporting

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER - LINE ITEM NUMBER - SE-05
1. TITLE  Plan, Material Control		2. NUMBER  4. DATE
3. USE  To describe the Contractor's system for identification, approval, control, and documentation of PEP materials and processes.		5. ORGANIZATION  6. REFERENCES MC999-0096  7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>Scope</u>  8.1.1 The plan shall describe the Contractor's proposed Material Control System in terms of: what shall be done; who is responsible for each element of the plan; what are the decision points; and what are the products. The system shall cover both original design configuration and as-built configuration.  8.1.2 Narrative explanations of how the System is intended to be utilized in complying with the requirements of MC999-0096.  8.1.3 A flow-diagram description of the principal control points from material call-out and procurement through fabrication and delivery of the end item.  8.2 <u>Content</u>  The plan shall include the following disciplines as applicable to MC999-0096.  A. Age Life Control B. Thermal Vacuum Stability C. Outgassing/Toxicity D. Flammability Control E. Other Degrading Processes F. Stress Corrosion Control  To include fracture analysis and inspection plan insuring adequate measures to prevent stress corrosion where possibility of a failure exists.  G. Fluid System Compatibility H. The Contractor shall include its suppliers within the Plan and the System.		

8.3 Maintenance

This plan shall be maintained current by page revision or complete revision, whichever is most cost effective.

8.4 Format

Optional.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		ORL NUMBER -- LINE ITEM NUMBER - SE-06
1. TITLE  PLAN, DESIGN DEVELOPMENT & TEST		2. NUMBER  4. DATE
3. USE  To provide a description of the contractor's technical activities required to design, develop, test and deliver the hardware necessary to fulfill PEP requirements		5. ORGANIZATION  5. REFERENCES  7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>Scope</u>  This DR establishes the content, format and maintenance requirements for a plan which shall describe the contractor's approach to accomplishing those technical tasks required to design, develop, test and deliver PEP hardware.		
8.2 <u>Content</u>  The plan shall include, as a minimum, the following elements:		
A. A description of the scope and purpose of the plan.		
B. A description of the project and the tasks to be accomplished, the purpose of the tasks and specific goals.		
C. A description of the contractor's systems for planning and controlling the technical effort involved in accomplishing the PEP project. This shall include a description of his technical organization and its responsibilities and authority. This shall include a description of how subcontractor technical effort is controlled.		
D. A description of the contractor's approach to identifying and accomplishing the technical tasks which will transform project requirements into delivered, qualified hardware. Included shall be:		
1. Preliminary baseline design definition		
2. Flow diagram showing sequence of activities to be accomplished from ATP through hardware delivery		
E. A description of the test program that verifies the design and validates the manufacturing and integration activities. The plan shall delineate the overall test parameters, limitations and methods to establish individual test procedures which satisfy the test criteria.		
1. As applicable, the plan shall identify the various types of tests required. As a minimum, the following shall be considered:		

- a. Development tests
  - b. Qualification tests (including component, subsystem and system)
  - c. Acceptance tests (including receiving, in-process, integrated systems and manufacturing checkout)
  - d. GSE checkout
2. The plan shall include an overall test flow diagram showing inter-relationship of testing levels and inputs to the major milestones of the design and development activities.
- F. A project schedule showing all major milestones and key interrelationships of various elements of design, development and test activities.
- G. A listing and utilization schedule of all facilities and equipment required to perform the design, development and test effort.
- H. A summary of the contractor's approach to manufacturing/procuring PEP hardware. This summary should identify those activities that are major factors in planning overall approach to designing, developing, procuring and testing the required hardware.
- I. A listing of all hardware to be provided and a display of the utilization of this hardware in support of design, development, test and delivery.

### 8.3 Format

The plan shall be prepared in narrative format and shall be divided into sections according to the subject matter listed in paragraph 8.2 of this DR. Tables, graphs, figures and charts shall be included as applicable.

### 8.4 Maintenance

The plan shall be maintained in a current condition and, when affected by approved program and/or hardware changes, shall be updated by page revision or complete reissue.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER • LINE ITEM NUMBER • SE-07
1. TITLE Plan, Electromagnetic Interference Control	2. NUMBER 4. DATE	
3. USE To define the formal program for EMEC control	5. ORGANIZATION 6. REFERENCES 7. INTERRELATIONSHIP	
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		

#### 8. PREPARATION INFORMATION

##### 8.1 SCOPE and CONTENT

The contractor's EMEC Control Plan shall delineate the following areas in detail:

- 8.1.1 Management controls to be implemented.
- 8.1.2 EMEC organization, size, authority, organizational location, responsibilities.
- 8.1.3 EMI-EMC prediction studies.
- 8.1.4 Breadboard tests (EMEC).
- 8.1.5 Design reviews (EMEC).
- 8.1.6 Input and output circuit parameters (impedances) for the EMEC computer program.
- 8.1.7 Electrical bonding.
- 8.1.8 Lightning indirect effect studies.
- 8.1.9 Wiring controls.
- 8.1.10 Circuit return isolation.

##### 8.2 FORMAT

Optional



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER -  
		LINE ITEM NUMBER - <b>SE-08</b>
1. TITLE  <b>Test Requirements - Qualification Test</b>		2. NUMBER  
		4. DATE  
3. USE  <b>To provide information on how qualification requirements will be satisfied</b>		5. ORGANIZATION  
		6. REFERENCES  
		7. INTERRELATIONSHIP  
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u>  This DR establishes minimum requirements for the preparation of a qualification test requirement documents.		
8.2 <u>CONTENT</u>		
8.2.1 Identification of the item to be qualified.		
8.2.2 Tabulation of verification requirements to be satisfied.		
8.2.3 Constraints data; i.e., activity that immediately constrains or is constrained by this test.		
8.2.4 Summary of tests, analyses or inspections to be performed.		
8.2.5 Contractors management approval signature.		
8.2.6 Identification of the measuring and test equipment to be used, including manufacturer's model number and type, range and accuracy, where applicable.		
8.2.7 Methods of measurement and schematic of set-up, where applicable.		
8.2.8 Conditions that must be maintained during test or inspection, i.e., ambient or environmental conditions/duration and sequence, as well as precautions to be observed to prevent damage.		
8.2.9 Pass - Fail criteria and significant parameters.		
8.3 <u>FORMAT</u>  Format is optional.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER -  LINE ITEM NUMBER - SF-09
1. TITLE Test Requirements - Acceptance		2. NUMBER  4. DATE
3. USE To provide information on how acceptance requirements will be satisfied		5. ORGANIZATION  6. REFERENCES  7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u> This DR establishes minimum requirements for the preparation of an acceptance test requirements document.		
8.2 <u>CONTENT</u>		
8.2.1 Identification of the item to be accepted.		
8.2.2 Tabulation of acceptance requirements to be satisfied by this procedure.		
8.2.3 Summary of test, checkout and/or inspections to be performed.		
8.2.4 Contractors management approval signature.		
8.2.5 Identification of the measuring and test equipment to be used, including manufacturer's model numbers and type, range and accuracy, where applicable.		
8.2.6 Methods of measurement and schematic of set-up.		
8.2.7 Conditions that must be maintained during acceptance, i.e., ambient or environmental conditions/duration and sequence, as well as precautions to be observed to prevent damage.		
8.2.8 Pass - Fail criteria and significant parameters.		
8.3 <u>FORMAT</u> Format is optional.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNN B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER -  LINE ITEM NUMBER - SE-10
1. TITLE  Reports, Test and Analysis (Certification)		2. NUMBER  4. DATE
3. USE  To provide data to validate certification requirements.		5. ORGANIZATION  6. REFERENCES  7. INTERRELATIONSHIP
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION		
8.1 <u>SCOPE</u>  Reports shall provide details of performance and results obtained by qualification test, or other test or analysis.		
8.2 <u>CONTENT</u>  Each report shall contain at least the following:		
8.2.1 Identification of the item being certified, including serial number or lot designation, where applicable.		
8.2.2 Description of the certification activity. In describing the activity, the report shall "stand alone" and not require reference to the relevant procedure. Suitable explanation shall be provided for cases where the actual activity differed from the governing procedure.		
8.2.3 Description of the test or analysis, and the sequence in which tasks were performed.		
8.2.4 Tabulation of the specific certification requirements being satisfied.		
8.2.5 Statement as to whether actual results satisfied requirements.		
A. For certification by test:		
1) Identification of parameters measured as well as the frequency and extent of functional evaluations.		
2) Detailed description of the test set-up. Still photographs, showing test fixtures, instrumentation and support equipment, shall be used.		
3) Detailed description of the test apparatus and instrumentation, including manufacturer, model number, serial number and calibration status.		

## 8.2.5 A. (Continued)

- 4) When post test disassembly is part of the certification requirements, results shall be presented in the form of measurement data and photographs taken at discrete points in the disassembly process. Specifically, this data shall cover any wear, distortion, damage and any other observed discrepant effects of testing.
- 5) Description of failures encountered, retest performed, with reference to: (a) failure reports, (b) analysis, and (c) corrective actions taken.
- 6) Dynamic environmental data, when applicable, presented as follows:
  - 6.1) Vibration data presented on 3 cycles x 3 cycles logarithmic graphs with the Horizontal and Vertical scales marked "Frequency" and "Acceleration" respectively. The graphs shall have a heading or a cover sheet listing the component tested by part number and serial number, and accelerometer serial number, sensing axis, full scale, and calibration voltage. Graphs shall cover the control accelerometer for each test condition.
    - a) Graphs depicting Sinusoidal Vibration data shall list, within the heading, accelerometer sweep rate and sweep direction.
    - b) Graphs depicting Random Vibration data shall list within the heading accelerometer composite level, and sampling time as well as analyzer bands, full scale, calibration voltage, wave analysis performed and time at which equalization during test occurred.
  - 6.2) Shock Pulse Data presented in graphic form with the horizontal and vertical scales marked "Time" and "Amplitude" respectively. The graphs shall indicate the high and low calibrated limits of amplitude and time increments of milliseconds with actual test results plotted within these parameters. Shock Pulse Graphs shall cover the control accelerometer for each shock and shall have a heading or a cover sheet listing the component tested by part number, serial number, input axis, accelerometer serial number, and magnetic tape acquisition speed in terms of inches per second
  - 6.3) Sustained acceleration levels applied during test documented in the form of mathematical calculations. A description of the calculations, as well as the methods and techniques used to determine specification compliance shall also be presented.

## 8.2.5 A. (Continued)

6.4) Thermal heating environments and thermal response measurements shall be presented in tabular and graphical time function formats. Data measurement points shall be identified on graphical presentations for those test where the data is not continuously acquired. The pressure environment shall be recorded and presented when the test pressure is greater or less than one atmosphere. The test data shall include identification of special pre-test conditioning and prior environmental exposures if previously tested.

6.5) Structural strain and deflection data shall be presented in both tabular and graphical format. Data shall be time coordinated with thermal conditions when applicable. Correction methods used to obtain true strain shall be described.

7) Post Test evaluation of data as related to pass-fail criteria and satisfaction of specific verification requirements.

## B. For Certification by Analysis:

- 1) Complete description of the analysis approach and underlying rationale.
- 2) Evaluation of analysis results as related to pass-fail criteria and satisfaction of specific certification requirements.
- 3) Detailed identification of computer and software involved, if analysis is computer aided.
- 4) Summary of results of the analysis.

8.3 FORMAT

Optional

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER - LINE ITEM NUMBER - <b>SE-11</b>
1. TITLE  <b>REQUIREMENTS, ORBITER ACCOMMODATION OF PEP</b>	2. NUMBER  4. DATE	5. ORGANIZATION  6. REFERENCES <b>MIL-STD-490</b> 7. INTERRELATIONSHIP <b>Orbiter/PEP ICD</b>
3. USE To identify hardware and software performance and design requirements that should be imposed on the Orbiter system for accommodation and utilization of the PEP system.		
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION  In order for the Orbiter system to accommodate and utilize the PEP system, new Orbiter requirements must be imposed. These requirements affect hardware and software design of the Orbiter and its Remote Manipulator System (RMS) as well as Orbiter payload provisions. This document identifies but does not impose these requirements. NASA will determine the means by which applicable requirements will be issued to the Orbiter, RMS, and payload contractors. In order to facilitate extraction of applicable requirements, this document should be based on the following outline or its equivalent:  1.0 Scope  2.0 Applicable Documents  3.0 Requirements  3.1 Orbiter Requirements 3.1.1 Structural/Mechanical 3.1.1.1 Envelope provisions for PEP 3.1.1.2 Mounting provisions for PEP 3.1.1.3 Payload structural/mechanical provisions affected by PEP (e.g., sharing of bridge fittings with tunnel, Spacelab; fewer mounting locations available for payloads) 3.1.2 Electrical Power 3.1.2.1 Accommodation and distribution of PEP supplied power 3.1.2.2 Supply of Orbiter bus power to PEP 3.1.2.3 Payload electrical provisions affected by PEP (e.g., increased power availability to payloads) 3.1.3 Avionics and Control 3.1.3.1 Accommodation of PEP data bus 3.1.3.2 Orbiter software for PEP 3.1.3.3 Activation/deactivation of PEP 3.1.3.4 Transmittal of PEP data/command signals via RMS 3.1.3.5 Actuation of PEP retention latches 3.1.3.6 Payload avionics and control provisions affected by PEP (e.g., sharing of RMS special purpose end effector wiring)		

### 3.1.4 Thermal Control

- 3.1.4.1 Supply of coolant to PEP
- 3.1.4.2 Transport and rejection of PEP heat load
- 3.1.4.3 Orbiter thermal balance
- 3.1.4.4 Payload thermal provisions affected by PEP

## 3.2 RMS Requirements

### 3.2.1 Structural/Mechanical

- 3.2.1.1 Envelope provisions for PEP
- 3.2.1.2 PEP cable mounting provisions
- 3.2.1.3 Payload structural/mechanical provisions affected by PEP  
(e.g., reduced wrist roll motion; presence of power connector on special purpose end effector)

### 3.2.2 Electrical Power

- 3.2.2.1 Transmittal of Orbiter bus power to PEP
- 3.2.2.2 Payload electrical provisions affected by PEP  
(e.g., sharing of special purpose end effector wiring)

### 3.2.3 Avionics and Control

- 3.2.3.1 Transmittal of PEP data/command signals from Orbiter
- 3.2.3.2 RMS software for PEP
- 3.2.3.3 Payload avionics and control provisions affected by PEP  
(e.g., sharing of special purpose end effector wiring)

### 3.2.4 Thermal Control

- 3.2.4.1 RMS thermal balance
- 3.2.4.2 Payload thermal provisions affected by PEP

Note: While this document is not a specification, certain of the identified requirements may be extracted for use in specifications. Therefore, MIL-STD-490, Specification Practices, should be used as a guide.

ATTACHMENT NUMBER		RESPONDENT											
EXHIBIT NUMBER		PREPARATION DATE:											
CONTRACT/RFP NUMBER		PAGE 1 of 1											
ORD NUMBER		REVISION											
PROJECT/SYSTEM		OSM/Power Extension Package (PEP) Project											
TITLE		NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENTS LIST (DRL) (The Center Data Manager (Code 4W2) will assign numbers in blocks d, f, and g.) TELEPHONE NUMBER 713 483-6391.											
1	LINE ITEM NO.	2	ORD NUMBER	3	4	5	6	7	8	9	10	11	12
1	TS-01												
9. REMARKS													
Plan, PEP Training													
First submittal due 225 days after ATP. Final 270 days after ATP.													
2	TS-02												
Schedule, PEP Training													
3	TS-03												
Analysis, PEP Training Req. Analysis (TRA)													
4													

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER - LINE ITEM NUMBER - <b>TS-01</b>
1. TITLE <b>Plan, Training</b>		2. NUMBER 4. DATE
3. USE To provide methods and procedures to be used to train personnel.		5. ORGANIZATION 6. REFERENCES <b>K-SM-12.5</b>
		7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION <p>The Contractor training plan will describe how training requirements, including the requirements set forth in NHB 5300.4 (1D-1), Paragraph 1D500.7, will be satisfied. The contents of each plan will be determined by Training Requirements Analysis results and the unique requirement of the processing and maintenance tasks; however, each plan will contain the following subject material:</p> <p>A. <u>Activities and Milestones</u> - All activities and milestones requiring training support</p> <p>B. <u>Training Objectives and Milestones</u> - Specific training objectives and milestones for each activity requiring training support.</p> <p>C. <u>Curriculum</u> - Curriculum requirements to satisfy training objectives established for each activity.</p> <p>D. <u>Student Population Groups</u> - Student loads by population group, facility, or functional organization estimated by category of training required.</p> <p>E. <u>Methods of Instruction</u> - Method of accomplishing training including on-the-job training (OJT), classroom, or audio-visual media.</p> <p>F. <u>Certification</u> - Method and requirements for certification training and criteria for establishing certification requirements.</p> <p>G. <u>Training Program Evaluation</u> - Method and requirements for evaluating the effectiveness of training programs and courses.</p> <p>H. <u>Readiness Measurement</u> - Method and procedures for measuring the readiness of individuals and teams to perform specified tasks.</p> <p>I. <u>Training Equipment</u> - Description and application of equipment required to satisfy training objectives.</p> <p>J. <u>Facilities</u> - Unique training facility requirements by site.</p>		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER DATA REQUIREMENT DESCRIPTION		DRL NUMBER •
		LINE ITEM NUMBER • TS-02
1. TITLE  Schedule, Training		2. NUMBER
		4. DATE
3. USE  To provide a schedule of PEP training courses to be conducted by the Contractor at KSC.		5. ORGANIZATION
		6. REFERENCES KHB-3410.1A/AD; K-SM-12.5
		7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION  Training schedules will be prepared in accordance with KHB 3410.1A/AD. A preliminary plan should be developed showing the milestones.  Level A courses will be scheduled periodically throughout the PEP Program.  Level B courses will be scheduled such that the highest frequency is in the beginning of the program and approaches some low level during the operational phase. These courses will train the engineers in the beginning of the PEP Program and maintain their system knowledge during the operational phase.  Level C course frequency will depend upon the number of people employed rather than program phase. These courses are aimed at improving and maintaining individual job skills.		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER <b>DATA REQUIREMENT DESCRIPTION</b>		DRL NUMBER -  
		LINE ITEM NUMBER - <b>TS-03</b>
1. TITLE  <b>Report, Training Requirement Analysis</b>		2. NUMBER  
		4. DATE  
3. USE in analysis of personnel against job tasks to be performed. Levels of training required are included. Personnel types and task descriptions are reviewed and compared with hardware usage functions and requirements to establish new skills for which training is required. Training requirements are then categorized by discipline, and for each potential student type; i.e., test conductors, engineers, technicians, inspectors, etc.		5. ORGANIZATION  
		6. REFERENCES  <b>K-SM-12.5</b>
		7. INTERRELATIONSHIP 1) WBS 2) All Plans
(The Center Data Manager (Code JM2) will assign numbers in block 2.)		
8. PREPARATION INFORMATION A. Include a format which summarizes the following minimum data:		
<p><u>Job Task &amp; Description</u>          Enter source of task identification          Briefly describe the task as it may be described in the source document.</p> <p><u>Personnel Requirements</u>          List personnel types requiring the training; i.e., test conductors, engineers, technicians, inspectors, etc.</p> <p><u>Proficiency Levels</u>          Enter the applicable task performance and task knowledge levels in accordance with Table 6-2 in K-SM-12.5. These are personnel achievement levels required to do the tasks.</p> <p><u>Required Courses</u>          The course number system will correspond to the Appendix A of K-SM-12.5. Descriptions of courses should also be provided.</p> <p><u>Course Length</u>          Estimated length of the respective courses.</p> <p><u>Remarks Column</u>          Requirements for certification should be noted. Any other pertinent data should be provided; i.e., training aids required.</p>		
B. The Training Requirements Analysis Document should:		
1) Call out training facilities requirements (shops, labs, classrooms).		
2) All items which the Contractor expects to be GFE.		
An example of format for the training requirements analysis is attached.		

TS-03

# TRAINING REQUIREMENTS ANALYSIS SHEET

Personnel Type \_\_\_\_\_  
 Operation/Location \_\_\_\_\_

Job Task Code and Description	Personnel Requirements	Proficiency	Required Courses				Course Length	Remarks
			Systems	GSE	Skill	Safety		